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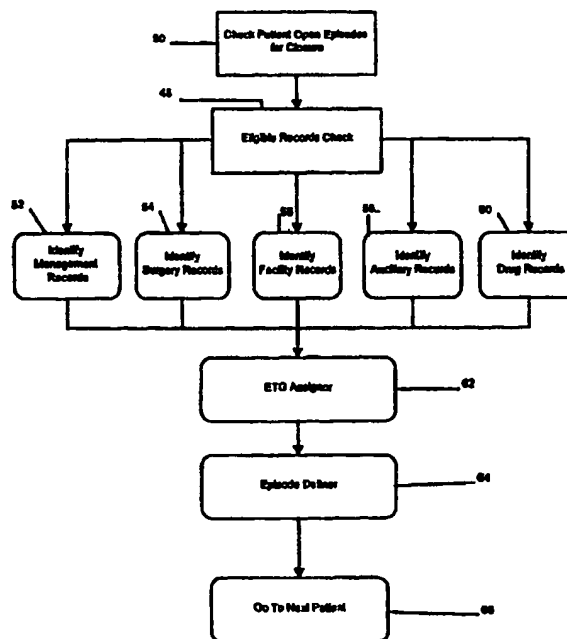
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(54) Title: COMPUTER-IMPLEMENTED METHOD FOR PROFILING MEDICAL CLAIMS

## (57) Abstract

A computer-implemented method for profiling medical claims to assist health care managers in determining the cost-efficiency and service quality of health care providers. The method allows an objective means for measuring and quantifying health care services. An episode treatment group (ETG) is a patient classification unit which defines (64) groups that are clinically homogeneous (similar cause of illness and treatment) and statistically stable. The ETG grouper methodology uses service or segment level claim data as input data and assigns (62) each service to the appropriate episode. The program identifies concurrent and recurrent episodes, flags records, creates new groupings, shifts groupings for changed conditions, selects the most recent claims, resets windows, makes a determination if the provider is an independent lab and continues to collect information until an absence of treatment is detected.



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## COMPUTER-IMPLEMENTED METHOD FOR PROFILING MEDICAL CLAIMS

### FIELD OF THE INVENTION

The present invention relates generally to computer-implemented methods for processing medical claims information. More particularly, the present invention relates to a computer-implemented method for receiving input data relating to a person's medical claim, establishing a management record for the person, establishing episode treatment groups to define groupings of medical episodes of related etiology, correlating subsequent medical claims events to an episode treatment group and manipulating episode treatment groups based upon time windows for each medical condition and co-morbidities.

### BACKGROUND OF THE INVENTION

Due to an increase in health care costs and inefficiency in the health care system, health care providers and service management organizations need health care maintenance systems which receive input medical claim data, correlate the medical claim data and provide a means for quantitatively and qualitatively analyzing provider performance. Because of the complex nature of medical care service data, many clinicians and administrators are not able to efficiently utilize the data. A need exists for a computer program that transforms inpatient and out patient claim data to actionable information which is logically understood by clinicians and administrators.

Performance is quickly becoming the standard by which health care purchasers and informed consumers select their health care providers. Those responsible for the development and maintenance of provider networks search for an objective means to measure and quantify the health care services provided to their clients. Qualitative and quantitative analysis of medical provider performance is a key element for managing and improving a health care network. Operating a successful health care network requires the ability to monitor and quantify medical care costs and care quality. Oftentimes, success depends on the providers' ability to identify and correct problems in their health care system. A need exists, therefore, for an analytical tool for identifying real costs in a given health care management system.

To operate a more efficient health care system, health care providers need to optimize health care services and expenditures. Many providers practice outside established utilization and cost norms. Systems that detect inappropriate coding, eliminate potentially inappropriate services or conduct encounter-based payment methodology are insufficient for correcting the inconsistencies of the health care system. When a complication or comorbidity is encountered during the course of treatment, many systems do not reclassify the treatment profile. Existing systems do not adjust for casemix, concurrent conditions or recurrent conditions. A system that compensates for casemix should identify the types of illnesses treated in a given population, determine the extent of resource application to specific types of illnesses, measure and compare the treatment patterns among individual and groups of health care providers and educate providers to more effectively manage risk. When profiling claims, existing systems establish classifications which do not contain a manageable number of groupings, are not clinically homogeneous or are not statistically stable. A need exists, therefore, for a patient classification system that accounts for differences in patient severity and establishes a clearly defined unit of analysis.

For many years, computer-implemented programs for increasing health care efficiency have been available for purchase. Included within the current patent literature and competitive information are many programs which are directed to the basic concept of health care systems.

The Mohlenbrock, et al. patent, U.S. Patent No. 4,667,292, issued in 1987, discloses a medical reimbursement computer system which generates a list identifying the most appropriate diagnostic-related group (DRG) and related categories applicable to a given patient for inpatient claims only. The list is limited by a combination of the characteristics of the patient and an initial principal diagnosis. A physician can choose a new designation from a list of related categories while the patient is still being treated. The manually determined ICD-9 numbers can be applied to an available grouper computer program to compare the working DRG to the government's DRG.

The Mohlenbrock, et al. patent, U.S. Patent No. 5,018,067, issued in 1991, discloses an apparatus and method for improved estimation of health resource consumption through the use of diagnostic and/or procedure grouping and severity of illness indicators. This system is a computer-implemented program that calculates the amount of payment to the

health provider by extracting the same input data as that identified in the Mohlenbrock '292 Patent teaching the DRG System. The system calculates the severity of the patient's illness then classifies each patient into sub-categories of resource consumption within a designated DRG. A computer combines the input data according to a formula consisting of constants and variables. The variables are known for each patient and relate to the number of ICD codes and the government weighing of the codes. The software program determines a set of constants for use in the formula for a given DRG which minimizes variances between the actual known outcomes and those estimated by use of the formula. Because it is based upon various levels of illness severity within each diagnosis, the results of this system provide a much more homogenous grouping of patients than is provided by the DRGs. Providers can be compared to identify those providers whose practice patterns are of the highest quality and most cost efficient. A set of actual costs incurred can be compared with the estimated costs. After the initial diagnosis, the system determines the expected costs of treating a patient.

The Schneiderman patent, U.S. Patent No. 5,099,424, issued in 1992, discloses a model user application system for clinical data processing that tracks and monitors a simulated out-patient medical practice using database management software. The system allows for a database of patients and the entry of EKG and/or chest x-ray (CXR) test results into separate EKG/CXR records as distinct logical entities. This system requires entry of test results which are not part of the medical claim itself. If not already present, the entry creates a separate lab record which may be holding blood work from the same lab test request. Portions of the information are transferred to the lab record for all request situations. Although the lab record data routine is limited to blood work, each time the routine is run, historical parameter data are sent to a companion lab record along with other data linking both record types. The system also includes a revision of the system's specialist record and the general recommendation from an earlier work for more explicit use in information management.

The Tawil patent, U.S. Patent No. 5,225,976, issued in 1993, discloses an automated health benefit processing system. This system minimizes health care costs by informing the purchasers of medical services about market conditions of those medical services. A database includes, for each covered medical procedure in a specific geographic area, a list of capable providers and their charges. A first processor identifies the insured then generates a

treatment plan and the required medical procedures. Next, the first processor retrieves information related to the medical procedures and appends the information to the treatment plan. A second processor generates an actual treatment record including the actual charges. A third processor compares the plan and the actual records to determine the amounts payable to the insured and the provider.

The Ertel patent, U.S. Patent No. 5,307,262, issued in 1994, discloses a patient data quality review method and system. The system performs data quality checks and generates documents to ensure the best description of a case. The system provides file security and tracks the cases through the entire review process. Patient data and system performance data are aggregated into a common data base which interfaces with existing data systems. Data profiles categorize data quality problems by type and source. Problems are classified as to potential consequences. The system stores data, processes it to determine misreporting, classifies the case and displays the case-specific patient data and aggregate patient data.

The Holloway, et al. patent, U.S. Patent No. 5,253,164, issued in 1993, discloses a system and method for detecting fraudulent medical claims via examination of service codes. This system interprets medical claims and associated representation according to specific rules and against a predetermined CPT-4 code database. A knowledge base interpreter applies the knowledge base using the rules specified. The database can be updated as new methods of inappropriate coding are discovered. The system recommends appropriate CPT codes or recommends pending the claims until additional information is received. The recommendations are based on the decision rules that physician reviewers have already used on a manual basis.

The Cummings patent, U.S. Patent No. 5,301,105, issued in 1994, discloses an all care health management system. The patient-based system includes an integrated interconnection and interaction of essential health care participants to provide patients with complete support. The system includes interactive participation with the patients employers and banks. The system also integrates all aspects of the optimization of health-inducing diet and life style factors and makes customized recommendations for health-enhancing practices. By pre-certifying patients and procedures, the system enhances health care efficiency and reduces overhead costs.

The Dorne patent, U.S. Patent No. 5,325,293, issued in 1994, discloses a system and method for correlating medical procedures and medical billing codes. After an examination, the system automatically determines raw codes directly associated with all of the medical procedures performed or planned to be performed with a particular patient. The system  
5 allows the physician to modify the procedures after performing the examination. By manipulating the raw codes, the system generates intermediate and billing codes without altering the raw codes.

The Kessler, et al. patent, U.S. Patent No. 5,324,077, issued in 1994, discloses a negotiable medical data draft for tracking and evaluating medical treatment. This system  
10 gathers medical data from ambulatory visits using a medical data draft completed by the provider to obtain payment for services, to permit quality review by medical insurers. In exchange for immediate partial payment of services, providers are required to enter data summarizing the patient's visit on negotiable medical drafts. The partial payments are incentives to providers for participating in the system.

The Torma, et al. patent, U.S. Patent No. 5,365,425, issued in 1994, discloses a  
15 method and system for measuring management effectiveness. Quality, cost and access are integrated to provide a holistic description of the effectiveness of care. The system compares general medical treatment databases and surveyed patient perceptions of care. Adjustments based on severity of illness, case weight and military costs are made to the data to ensure that  
20 all medical facilities are considered fairly.

Health Chex's PEER-A-MED computer program is a physician practice profiling system that provides case-mix adjusted physician analysis based on a clinical severity concept. The system employs a multivariate linear regression analysis to appropriately adjust for case-mix. After adjusting for the complexity of the physician's case-load, the system  
25 compares the relative performance of a physician to the performance of the peer group as a whole. The system also compares physician utilization performance for uncomplicated, commonly seen diagnosis. Because the full spectrum of clinical care that is rendered to a patient is not represented in its databases, the system is primarily used as an economic performance measurement tool. This system categorizes the claims into general codes  
30 including acute, chronic, mental health and pregnancy. Comorbidity and CPT-4 codes adjust for acuity level. The codes are subcategorized into twenty cluster groups based upon the

level of severity. The system buckets the codes for the year and contains no apparent episode building methodology. While the PEER-A-MED system contains clinically heterogeneous groupings, the groupings are not episode-based and recurrent episodes cannot be accounted.

5 Ambulatory Care Groups (ACG) provides a patient-based system which uses the patient and the analysis unit. Patients are assigned to an diagnosis group and an entire year's claims are bucketed into thirty-one diagnosis groups. By pre-defining the diagnosis groups, this is a bucketing-type system and claim management by medical episode does not occur. The system determines if a claim is in one of the buckets. Because different diseases could be categorized into the same ACG, this system is not clinically homogeneous. An additional  
10 problem with ACGs are that too many diagnosis groups are in each ACG.

Ambulatory Patient Groups (APGs) are a patient classification system designed to explain the amount and type of resources used in an ambulatory visit. Patients in each APG have similar clinical characteristics and similar resource use and cost. Patient characteristics should relate to a common organ system or etiology. The resources used are constant and  
15 predictable across the patients within each APG. This system is an encounter-based system because it looks at only one of the patient's encounters with the health care system. This system mainly analyzes outpatient hospital visits and does not address inpatient services.

The GMIS system uses a bucketing procedure that profiles by clumps of diagnosis codes including 460 diagnostic episode clusters (DECs). The database is client specific and  
20 contains a flexible number and type of analytic data files. This system is episode-based, but it does not account for recurrent episodes, so a patient's complete data history within a one year period is analyzed as one pseudo-episode. Signs and symptoms do not cluster to the actual disease state, e.g. abdominal pain and appendicitis are grouped in different clusters. This system does not use CPT-4 codes and does not shift the DEC to account for acuity  
25 changes during the treatment of a patient.

Value Health Sciences offers a value profiling system, under the trademark VALUE PROFILER, that utilizes a DB2 mainframe relational database with 1,800 groups. The system uses ICD9 and CPT-4 codes which are bucket codes. Based on quality and cost-effectiveness of care, the system evaluates all claims data to produce case-mix adjusted  
30 profiles of networks, specialties, providers and episodes of illness. The pseudo-episode building methodology contains clinically pre-defined time periods during which claims for a



patient are associated with a particular condition and designated provider. The automated practice review system analyzes health care claims to identify and correct aberrant claims in a pre-payment mode (Value Coder) and to profile practice patterns in a post-payment mode (Value Profiler). This system does not link signs and symptoms and the diagnoses are non-comprehensive because the profiling is based on the exclusion of services. No apparent shifting of episodes occurs and the episodes can only exist for a preset time because the windows are not recurrent.

The medical claim profiling programs described in foregoing patents and non-patent literature demonstrate that, while conventional computer-implemented health care systems exist, they each suffer from the principal disadvantage of not identifying and grouping medical claims on an episodic basis or shifting episodic groupings based upon complications or co-morbidities. The present computer-implemented health care system contains important improvements and advances upon conventional health care systems by identifying concurrent and recurrent episodes, flagging records, creating new groupings, shifting groupings for changed clinical conditions, selecting the most recent claims, resetting windows, making a determination if the provider is an independent lab and continuing to collect information until an absence of treatment is detected.

#### SUMMARY OF THE INVENTION

Accordingly, it is a broad aspect of the present invention to provide a computer-implemented medical claims profiling system.

It is a further object of the present invention to provide a medical claims profiling system that allows an objective means for measuring and quantifying health care services.

It is a further object of the present invention to provide a medical claims profiling system that includes a patient classification system based upon episode treatment groups.

It is a further object of the present invention to provide a medical claims profiling system that groups claims to clinically homogeneous and statistically stable episode treatment groups.

It is a further object of the present invention to provide a medical claims profiling system that includes claims grouping utilizing service or segment-level claim data as input data.

It is a further object of the present invention to provide a medical claims profiling system that assigns each claim to an appropriate episode.

It is a further object of the present invention to provide a medical claims profiling system that identifies concurrent and recurrent episodes.

5 It is a further object of the present invention to provide a medical claims profiling system that shifts groupings for changed clinical conditions.

It is a further object of the present invention to provide a medical claims profiling system that employs a decisional tree to assign claims to the most relevant episode treatment group.

10 It is a further object of the present invention to provide a medical claims profiling system that resets windows of time based upon complications, co-morbidities or increased severity of clinical conditions.

It is a further object of the present invention to provide a health care system that continues to collect claim information and assign claim information to an episode treatment group until an absence of treatment is detected.

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It is a further object of the present invention to provide a health care system that creates orphan records.

It is a further object of the present invention to provide a health care system that creates phantom records.

20

The foregoing objectives are met by the present system which allows an objective means for measuring and quantifying health care services based upon episode treatment groups (ETGs). An episode treatment group (ETG) is a clinically homogenous and statistically stable group of similar illness etiology and therapeutic treatment. ETG grouper method uses service or segment-level claim data as input data and assigns each service to the appropriate episode.

25

ETGs gather all in-patient, ambulatory and ancillary claims into mutually exclusive treatment episodes, regardless of treatment duration, then use clinical algorithms to identify both concurrent and recurrent episodes. ETG grouper method continues to collect information until an absence of treatment is detected for a predetermined period of time commensurate with the episode. For example, a bronchitis episode will have a sixty day window, while a myocardial infarction may have a one year window. Subsequent records of

30

the same nature within the window reset the window for an additional period of time until the patient is asymptomatic for the pre-determined time period.

ETGs can identify a change in the patient's condition and shift the patient's episode from the initially defined ETG to the ETG which includes the change in condition. ETGs  
5 identify all providers treating a single illness episode, allowing the user to uncover specific treatment patterns. After adjusting for case-mix, ETGs measure and compare the financial and clinical performance of individual providers or entire networks.

Medical claim data is input as data records by data entry into a computer storage device, such as a hard disk drive. The inventive medical claims profiling system may reside  
10 in any of a number of computer system architectures, i.e., it may be run from a stand-alone computer or exist in a client-server system, for example a local area network (LAN) or wide area network (WAN).

Once relevant medical claim data is input, claims data is processed by loading the computer program into the computer system memory. During set-up of the program onto the  
15 computer system, the computer program will have previously set pointers to the physical location of the data files and look-up tables written to the computer storage device. Upon initialization of the inventive computer program, the user is prompted to enter an identifier for a first patient. The program then checks for open episodes for the identified patient, sets flags to identify the open episodes and closes any episodes based upon a predetermined time  
20 duration from date of episode to current date. After all open episodes for a patient are identified, the new claims data records are read to memory and validated for type of provider, CPT code and ICD-9 (dx) code, then identified as a management, surgery, facility, ancillary, drug or other record.

As used herein, "Management records" are defined as claims which represent a  
25 service by a provider engaging in the direct evaluation, management or treatment of a patient. Examples of management records include office visits and therapeutic services. Management records serve as anchor records because they represent focal points in the patient treatment as well as for related ancillary services.

"Ancillary records" are claims which represent services which are incidental to the  
30 direct evaluation, management and treatment of the patient. Examples of ancillary records include X-ray and laboratory tests.

"Surgery records" are specific surgical claims. Surgery records also serve as anchor records.

"Facility records" are claims for medical care facility usage. Examples of facility records include hospital room charges or outpatient surgical room charges.

5 "Drug records" are specific for pharmaceutical prescription claims.

"Other records" are those medical claim records which are not management, surgery, ancillary, facility or drug records.

Invalid records are flagged and logged to an error output file for the user. Valid records are then processed by an ETG Assignor Sub-routine and, based upon diagnosis code,  
10 is either matched to existing open episodes for the patient or serve to create new episodes.

Management and surgery records serve as "anchor records." An "anchor record" is a record which originates a diagnosis or a definitive treatment for a given medical condition. Management and surgery records serve as base reference records for facility, ancillary and drug claim records relating to the diagnosis or treatment which is the subject of the  
15 management or surgery record. Only management and surgery records can serve to start a given episode.

If the record is a management record or a surgery record, the diagnosis code in the claim record is compared with prior related open episodes in an existing look-up table for a possible ETG match. If more than one open episode exists, the program selects the most  
20 recent open episode. A positive match signifies that the current episode is related to an existing open episode. After the match is determined, the time window is reset for an additional period of time corresponding to the episode. A loop shifts the originally assigned ETG based on the additional or subsequent diagnoses. If any of the additional or subsequent diagnoses is a defined co-morbidity diagnosis, the patient's co-morbidity file updated. If no  
25 match between the first diagnosis code and an open episode is found, a new episode is created.

Grouping prescription drug records requires two tables, a NDC (National Drug Code) by GDC (Generic Drug Code) table and a GDC by ETG table. Because the NDC table has approximately 200,000 entries, it has been found impracticable to directly construct an NDC  
30 by ETG table. For this reason the NDC by GDC table serves as a translation table to translate NDCs to GDCs and construct a smaller table based upon GDCs. Reading, then

from these tables, the NDC code in the claim data record is read and translated to a GDC code. The program then identifies all valid ETGs for the GDC codes in the claim data record then matches those valid ETGs with active episodes.

5 These and other objects, features and advantages of the present invention will become more apparent to those skilled in the art from the following more detailed description of the non-limiting preferred embodiment of the invention taken with reference to the accompanying Figures.

#### BRIEF DESCRIPTION OF THE DRAWINGS

10 Briefly summarized, a preferred embodiment of the invention is described in conjunction with the illustrative disclosure thereof in the accompanying drawings, in which:

FIG. 1 is a diagrammatic representation of a computer system used with the computer-implemented method for analyzing medical claims data in accordance with the present invention.

15 FIG. 2 is a flow diagram illustrating the general functional steps of the computer implemented method for analyzing medical claims data in accordance with the present invention.

FIG. 3 is a flow diagram illustrating an Eligible Record Check routine which validates and sorts patient claim data records.

20 FIGS. 4A to 4F are flow diagrams illustrating the Management Record Grouping Sub-routine of the ETG Assignor Routine in accordance with the computer-implemented method of the present invention.

FIGS. 5A-5D are flow diagrams illustrating a Surgery Record Grouping Sub-routine of the ETG Assignor Routine in accordance with the computer-implemented method of the present invention.

25 FIGS. 6A-6E are flow diagrams illustrating a Facility Record Grouping Sub-routine of the ETG Assignor Routine in accordance with the computer-implemented method of the present invention.

30 FIGS. 7A-B are flow diagrams illustrating an Ancillary Record Grouping Sub-routine of the ETG Assignor Routine in accordance with the computer-implemented method of the present invention.

FIGS. 8A-8C are flow diagrams illustrating a Drug Record Grouping Sub-routine of the ETG Assignor Routine in accordance with the computer-implemented method of the present invention.

5 FIG. 9 is a flow diagram illustrating the Episode Definer Routine in accordance with the computer-implemented method of the present invention.

FIG. 10 is diagrammatic timeline illustrating a hypothetical patient diagnosis and medical claims history during a one year period and grouping of claim records as management records and ancillary records with cluster groupings.

10 FIG. 11 is a diagrammatic representation of a I-9 Diagnosis Code (dx) X ETG table illustrating predetermined table values called by the Episode Definer Routine of the present invention.

FIG. 12 is a diagrammatic representation of an I-9 Diagnosis Code 9 (dx) X CPT Code table illustrating predetermined table values called by the Episode Definer Routine of the present invention.

15 FIG. 13 is a diagrammatic representation of a National Drug Code (NDC) to Generic Drug Code (GDC) conversion table illustrating predetermined Generic Drug Code values called by the Drug Record Grouping Sub-routine of the Episode Definer Routine of the present invention.

20 FIG. 14 is a diagrammatic representation of a Generic Drug Code (GDC) to Episode Treatment Group (ETG) table illustrating predetermined table values called by the Drug Record Grouping Sub-routine of the Episode Definer Routine of the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring particularly to the accompanying drawings, the basic structural elements of a health care management system of the present invention are shown. Health care  
25 management system consists generally of a computer system 10. Computer system 10 is capable of running a computer program 12 that incorporates the inventive method is shown in FIG. 1. The computer system 10 includes a central processing unit (CPU) 14 connected to a keyboard 16 which allows the user to input commands and data into the CPU 14. It will be understood by those skilled in the art that CPU 14 includes a microprocessor, random access  
30 memory (RAM), video display controller boards and at least one storage means, such as a

hard disk drive or CD-ROM. The computer system 10 also contains a video display 18 which displays video images to a person using the computer system 10. The video display screen 18 is capable of displaying video output in the form of text or other video images.

Episode Treatment Groups (ETGs) are used to define the basic analytical unit in the computer-implemented method of the present invention. ETGs are episode based and conceptually similar to Diagnostic Related Groups (DRGs), with a principal difference being that DRGs are inpatient only. ETGs encompass both inpatient and outpatient treatment.

Using ETGs as the basic episodic definer permits the present invention to track concurrently and recurrently occurring illnesses and correctly identify and assign each service event to the appropriate episode. Additionally, ETGs account for changes in a patient's condition during a course of treatment by shifting from the initially defined ETG to one which includes the changed condition once the changed condition is identified.

The inventive medical claims profiling system defines Episode Treatment Groups (ETGs). The number of ETGs may vary, depending upon the definitional specificity the health care management organization desires. Presently, the inventive system defines 558 ETGs, which are assigned ETG Numbers 1-900 distributed across the following medical areas: Infectious Diseases, Endocrinology, Hematology, Psychiatry, Chemical Dependency, Neurology, Ophthalmology, Cardiology, Otolaryngology, Pulmonology, Gastroenterology, Hepatology, Nephrology, Obstetrics, Gynecology, Dermatology, Orthopedics and Rheumatology, Neonatology, Preventative and Administrative and Signs and Isolated Signs, Symptoms and Non-Specific Diagnoses or Conditions. Under the presently existing system, ETG 900 is reserved to "Isolated Signs, Symptoms and Non-Specific Diagnoses or Conditions," and is an ETG designation used where the diagnosis code is incapable of being assigned to another ETG. A listing of exemplary ETGs for typical episodes is attached as Appendix 1. Those skilled in the art will understand, however, that the number of ETGs may change, the ETG numbering system is variable, the ETG classifications may be defined with relatively broader or narrower degrees of specificity and the range of medical specialties may be greater or fewer, as required may be require by the management organization in their medical claims data analysis protocols.

An episode may be considered a low outlier or high outlier. Low outliers are episodes with dollar values below the minimum amount which is specific to each ETG. Examples of low outliers include patients which drop from a plan during mid-episode and patients who use out-of-network providers and do not submit claims. High outliers are those episodes with high dollar values greater than the 75th percentile plus 2.5 times the interquartile range, based upon a predefined database. The low and high outlier points are pre-determined and hard-coded into the inventive system and will vary across analysis periods.

If no ICD-9 (diagnosis code) on a given record matches the CPT-4 code, i.e., a diagnosis of bronchitis and a CPT of knee x-ray, an invalid code segment results. The inventive system outputs invalid records and discontinues the processing of these records. An invalid ICD-9 code is assigned to ETG 997, an invalid CPT-4 code is assigned to ETG 996 and an invalid provider type is assigned to ETG 995. A sequential anchor count and a sequential episode count are incremented after each ETG assignment. Active open and closed ETG files include ETG number, sequential episode number, most recent anchor from date of service and most recent sequential anchor record count. An alternative embodiment creates a single record for each individual episode containing ETG number, patient age, patient sex, episode number, total charges, total payments, earlier anchor record, last anchor record, whether the episode was closed ("clean finish"), number of days between database start date and earliest anchor record, whether a number of days between database start date and earliest anchor record exceeds the ETG's days interval, patient identification, physician identification, management charges, management paid, surgery charges, surgery paid, ancillary charges and ancillary paid.

The inventive system uses clinical algorithms to identify both concurrent and recurrent episodes. Subsequent episodes of the same nature within a window reset the window for an additional period of time until the patient is asymptomatic for a pre-determined time period. If an ETG matches a prior ETG, a recurrent ETG is created and the window is reset. The most recent claim is selected if more than one matched claim exists. If the ETG does not match an active ETG, a new concurrent ETG is created.

Comorbidities, complications or a defining surgery could require an update of the patient's condition to an ETG requiring a more aggressive treatment profile. ETG's changes



in the patient's clinical condition and shift the patient's episode from the initially defined ETG to an ETG which includes the change in clinical condition.

If the claim is an ancillary record and it does not match an active ETG it is designated an "orphan" ancillary record.

5 Termination of an episode is detected by an absence of treatment for a period of time commensurate with the episode.

If the claim is a prescription drug record, two pre-defined tables written to the computer data storage medium, are read. The first of the tables is a National Drug Code (NDC) by Generic Drug Code (GDC) table. The GDC code is equivalent to the Generic  
10 Drug Code table known in the art. This table acts as a translator table to translate a large number of NDCs to a smaller set of GCNs. A second pre-defined table is employed and is constructed as a GDC by ETG table. The GDC by ETG table is used, in conjunction with the NDC by GDC translator table, to identify all valid ETGs for a particular NDC code in the claim record.

15 To determine specific treatment patterns and performance contributions, the computer-implemented method identifies all providers treating a single illness episode. If a network of providers contains Primary Care Physicians (PCP), the ETGs clearly identify each treatment episode by PCP. Financial and clinical performance of individual providers or entire networks may be monitored and analyzed. To monitor health care cost management  
20 abilities of providers, components of a provider's treatment plan may be analyzed by uncovering casemix-adjusted differences in direct patient management, the use of surgery and the prescribing of ancillary services. By identifying excessive utilization and cost areas, continuous quality improvement protocols are readily engineered based on internally or externally derived benchmarks. After adjusting for location and using geographically  
25 derived normative charge information, ETG-based analysis compares the cost performance of providers or entire networks. By using geographically derived utilization norms, the present invention forms the methodology base for measuring both prevalence and incidence rates among a given population by quantifying health care demand in one population and comparing it to external utilization norms. This comparison helps to identify health care  
30 providers who practice outside established utilization or cost norms.

Turning now to Figure 2, there is illustrated the general operation of the computer-implemented method of the present invention. Those skilled in the art will understand that the present invention is first read from a removable, transportable recordable medium, such as a floppy disk, magnetic tape or a CD-ROM onto a recordable, read-write medium, such as a hard disk drive, resident in the CPU 14. Upon a user's entry of appropriate initialization commands entered via the keyboard 16, or other input device, such as a mouse or trackball device, computer object code is read from the hard disk drive into the memory of the CPU 14 and the computer-implemented method is initiated. The computer-implemented method prompts the user by displaying appropriate prompts on display 18, for data input by the user.

Those familiar with medical claims information processing will understand that medical claims information is typically received by a management service organization on paper forms. If this is the case, a user first manually sorts claim records by patient, then input patient data through interfacing with the CPU 14 through the keyboard 16 or other input device.

Prior to being submitted to the grouping algorithm, records must be sorted by patient by chronological date of service. An Eligible Record Check routine 48 to verify the validity and completeness of the input data. As each record is read by the software, it first checks the date of service on the record and compares it to the last service date of all active episodes to evaluate which episodes have expired in terms of an absence of treatment. These episodes are closed at step 50. Next the record is identified as either a management 52, surgery 54, facility 56, ancillary 58 or drug 60 record. These types of records are categorized as follows:

"Management records" are defined as claims which represent a service by a provider engaging in the direct evaluation, management or treatment of a patient. Examples of management records include office visits, surgeries and therapeutic services. Management records serve as anchor records because they represent focal points in the patient treatment as well as for related ancillary services.

"Ancillary records" are claims which represent services which are incidental to the direct evaluation, management and treatment of the patient. Examples of ancillary records include X-ray and laboratory tests.

"Surgery records" represent surgical procedures performed by physicians and other like medical allied personnel. Like management records, surgery records also serve as anchor records.

5 "Facility records" are claims for medical care facility usage. Examples of facility records include hospital room charges or ambulatory surgery room charges.

"Drug records" are specific for pharmaceutical prescription claims.

A "cluster" is a grouping of one, and only one, anchor record, management or surgery, and possibly ancillary, facility and/or drug records. A cluster represents a group of services in which the focal point, and therefore the responsible medical personnel, is the anchor record. An episode is made up of one or more clusters.

After the management, surgery, facility, ancillary and drug records are identified at steps 52, 54, 56, 58 and 60, respectively, an ETG Assignor Sub-routine is executed at step 62. The ETG Assignor Sub-routine 62 assigns patient medical claims to ETGs based one or more cluster of services related to the same episode, and provides for ETG shifting upon encountering a diagnosis code or CPT code which alters the relationship between the diagnosis or treatment coded in the claim record and an existing ETG assignment. For example, ETG's may be shifted to account for changes in clinical severity, for a more aggressive ETG treatment profile if a complication or comorbidity is encountered during the course of treatment for a given ETG or where a defining surgery is encountered during the course of treatment for a given ETG.

When the last claim data record for a given patient is processed by the ETG Assignor Routine 62, the Episode Definer Routine is executed at step 64. Episode Definer Routine 64 identifies all open and closed ETG episodes for the patient and appropriately shifts any episodes to a different ETG if such ETG is defined by age and/or the presence or absence of a co-morbidity. The patient records are then output to a file with each record containing the ETG number, a sequential episode number, and a sequential cluster number. Upon input of an identifier for the next patient, the processing of medical claims for the next patient is initiated at step 66 by looping back to check for eligible records for the new patient at step 48. Operation of the Eligible Record Check routine 100 is illustrated in Figure 3. The patient records input by the user are read from the recordable read-write data storage medium into the CPU 14 memory in step 102. From the patient records read to memory in step 102, a

record validation step 104 is carried out to check provider type, treatment code and diagnosis code against pre-determined CPT code and diagnosis code look up tables. The diagnosis code is preferably the industry standard ICD-9 code and the treatment code is preferably the industry standard CPT-4 code. All valid patient records are assigned as one of a)  
5 management record, b) ancillary record, c) surgery record, d) facility record, e) drug record or f) other record, and coded as follows:

m= management record;

a= ancillary record;

s= surgery record;

10 f= facility record;

d= drug record; or

o= other record.

A sort of valid records 106 and invalid records 108 from step 104 is made. For valid records 106 in step 110, patient age is then read to memory from the first patient record from  
15 step 106. All valid records are then sorted by record type in step 112, i.e., record type m, a, s, f, d or o by a date of service from date (DOS-from). A sort index of all record-type sorted records from step 116 is generated and written to the hard disk, and the ETG Assignor routine 120 is initialized.

For invalid records 108 identified at step 104, the records are assigned ETG  
20 designations reserved for records having invalid provider data, invalid treatment code, or invalid diagnosis code, e.g., ETG 995, 996 and 997, respectively, at step 111. An error log file is output identifying the invalid records by reserved ETG and written to disk or displayed for the user and processing of the invalid records terminates at step 113.

The computer-implemented method of the present invention then initializes an  
25 Episode Assignor Routine 200, the operation of which is illustrated in Figures 4A-8C. Episode Assignor Routine 200 consists generally of five Sub-routine modules for processing management records, surgery records, facility records, ancillary records and drug records and assigning claims to proper ETGs. Figures 4A-4F illustrate initial identification of records as management, surgery, facility ancillary and drug records and the Management Record  
30 Grouping Sub-Routine. Figures 5A-5E illustrate operation of the Surgery Record Grouping routine 400 for matching surgery claim records to proper ETGs. Figures 6A-6E illustrate

operation of the Facility Record Grouping routine 500 for matching facilities records to proper ETGs. Figures 7A-7 illustrate operation of the Ancillary Record Grouping routine 600 for matching ancillary records to proper ETGs. Finally, Figures 8A-8C illustrate operation of the Drug Records Grouping routine 700 for matching drug records to proper ETGs.

### **Management Records**

The Episode Assignor routine begins by executing a Management Records Grouping Sub-routine 200, illustrated in Figures 4A-4F, first reads the input claim record for a given patient in step 202. The first processing of the input claim record entails categorizing the record as a management, surgery, facility, ancillary or drug record at step 204. A series of logical operands 208, 210, 212 and 214, read the record and determine whether the record is a management record at step 204, a surgery record at step 208, a facility record at step 210, an ancillary record at step 212 or a drug record at step 214. If an affirmative response is returned in response to logical operand 204, grouping of the management record to an ETG is initialized and processing of the management record proceeds to step 215. If, however, a negative response is returned in response to the logical operand 206, logical operand 208 is executed to determine whether the record is a surgery record. If an affirmative response is returned from logical operand 208, the Surgery Record Grouping routine 400 is initialized. If, however, a negative response to logical operand 208 is returned, logical operand 210 is executed to determine whether the record is a facility record. If an affirmative response is returned in response to logical operand 210, the Facility Record Grouping Sub-routine 500 is executed. If, however, a negative response is returned in response to the logical operand 210, logical operand 212 is executed to determine whether the record is an ancillary record. If an affirmative response is returned from logical operand 212, the Ancillary Record Grouping Sub-routine 600 is executed. If, however, a negative response to logical operand 212 is returned, logical operand 214 is executed to determine whether the record is a facility record. At this point all records except drug records have been selected. Thus, all the remaining records are drug records and the Drug Record Grouping Sub-routine 700 is executed.

Returning now to the initialization of the Management Record Grouping routine 200, and in particular to step 215. Once the record has been categorized as a management record

in step 206, the DOS-to value is compared to active episodes for the patient to determine if any active episodes should be closed. Closed episodes are moved to an archive created on the storage means, such as a hard disk or CD-ROM.

The management record is examined and the first diagnosis code on record is read, a  
5 diagnosis code (dx) by ETG table 201 is read from the storage means and all valid ETGs for the first diagnosis code on record are identified at step 216. The dx by ETG table 201 consists of a table matrix having diagnosis codes on a first table axis and ETG numbers on a second table axis. At intersection cells of the dx by ETG table are provided table values which serve as operational flags for the inventive method. In accordance with the preferred  
10 embodiment of the invention, dx by ETG table values are assigned as follows:

P = primary, with only one P value existing per ETG;

S = shift;

I = incidental;

A = shift to ETG with C value; and

15 C = P, where P' is a shiftable primary value.

An illustrative example of a section of a dx by ETG table is found at Figure 11.

ETG validation in step 216 occurs where for a given diagnosis code on record, the code has either a P, S, I, A or C dx-ETG table value. The ETGs identified as valid for the first diagnosis code on record in step 216, are then matched with active open ETGs in step  
20 217 by comparing the valid ETGs with the open ETGs identified in step 215. A logical operand is then executed at step 218 to determine whether a match exists between the valid ETG from the management record and any open ETGs. A negative response at step 218 causes execution of another logical operand at step 220 to determine whether for the first diagnosis code is the P value in the dx-ETG table equal to the ETG for non-specific  
25 diagnosis, i.e., ETG 900. If an affirmative response is returned at step 216, ETG identifiers for the second to the fourth diagnosis codes in the management record are established from the dx-ETG table and the ETG identifier value is matched to active specific ETGs in step 222 and execution of the program continues as represented by designator AA 236 bridging to Figure 5B. If, however, a negative response is returned from logical operand 220, a value of  
30 one is added to the management record or anchor count and to the episode count and the ETG with a P value on the dx-ETG table is selected and a new episode is initialized. Further

processing of the new episode by the program continues as represented by designator F 236 bridging to Figure 5C.

If an affirmative response is returned at logical operand step 218, the matched active ETG with the most recent DOS-to are selected at step 230. If a tie is found based upon most recent DOS-to values, then the most recent DOS-from value is selected for matching with active ETGs. If a tie is found at most recent DOS-from values is found, the first encountered ETG is selected and matched. A value of one is then added to the management record or anchor record counter at step 232 and further processing continues as represented by designator G 238 bridging to Figure 5C.

Turning now to Figure 4B, which is a continuation from designator AA 236 of Figure 4A, identifier ETGs for the second to fourth diagnoses in the management record are matched to active ETGs in logical operand 237. If an affirmative response is returned in response to logical operand 237, the matched active ETG with the most recent DOS-to is selected in step 240. If there is a tie between two or more ETGs with the most recent DOS-to value, the most recent DOS-from ETG is selected. If, however, there is a tie between two or more active ETGs with the most recent DOS-from value, then the first encountered ETG is selected in step 240. A value of one is then added to the sequential anchor record counter in step 241 and operation of the computer-implemented method continues as indicated by designator G 243 bridging to Figure 5C.

From logical step 237, if a negative response is returned, the ETG with the second diagnosis value of P is selected at step 242, then a logical query is made to determine whether the selected ETG is a non-specific ETG, i.e., ETG 900 at step 244. A negative response to logical query 244 causes a value of one to be added to the sequential anchor count and to the sequential episode count at step 254. If an affirmative response to logical query 244 is returned, logical queries 246 and 248 are sequentially executed to select ETGs with the third and fourth diagnosis values of P from the dx-ETG table written on the storage means, respectively, and logical query 244 is executed to determine whether the selected ETG is the non-specific ETG, i.e., ETG 900. If a negative response is returned to logical query 244 for the ETG selected in step 248, a value of one is added to the sequential anchor count and to the sequential episode count in step 254. If an affirmative response is returned

from logical query 244, a value of one is added to the sequential anchor count and the sequential episode count at step 250.

From step 250, the non-specific ETG, i.e., ETG 900 is selected and a new episode is started in the active ETG file. The updated sequential episode number, the updated  
5 sequential anchor count, the DOS-from and the DOS-to from the record are written to the new episode in the active ETG file in step 252.

From step 254, the ETG with a dx-ETG table value of P is selected and a new episode is started in the active ETG file. The updated sequential episode number, the updated sequential anchor count, the DOS-from and the DOS-to from the record are written to the  
10 new episode in the active ETG file in step 256. A comorbidity file written on the storage means is then updated with all the dx codes in the management record in step 258.

From each of steps 252 and steps 258 a check is made to determine whether the processed management record is the last record for the patient at logical step 260. An affirmative response returned to logical step 260 prompts the program operation to the  
15 Episode Definer Sub-routine 264, bridging to Figure 9 with identifier GG, while a negative response to logical step 260 returns program operation to the beginning of the ETG Assignor routine 200 and the next patient record is read at step 262.

Turning now to Figure 4C, the bridge reference G 238 is continued from Figure 4A. For those records having a match with an open ETG, a query is made at step 270 of the dx-  
20 ETG table 201 to determine the table value of the dx code for the selected ETG. Again, valid table values are one of P, S, I, A, or C. If the table value returned from step 270 is A, the selected ETG in the active file is changed at step 272 to the ETG number having an equivalent table value of C for the diagnosis on record. If the table value returned from step 270 is S, the selected ETG in the active file is shifted at step 274 to an ETG value having a  
25 table value of P for the diagnosis code on record. If the table value is one of P, I or C, the ETG remains the same and the selected active ETG's most recent DOS-to is updated by writing the record date to the ETG DOS-to field, and the sequential anchor count in the selected active ETG is updated to reflect writing of the record to the ETG at step 276.

At step 278, the record is then written with a sequential episode number and the  
30 sequential anchor count of the selected ETG from the selected active ETG. In this manner, the record is identified with the ETG and the specific episode. The patient's co-morbidity



file is flagged with the output read from bridge designator F at step 234. A patient's comorbidity file is a predefined list of diagnoses which have been identified as comorbidities. If during the course of grouping a patient's records, a management record is encountered which is a comorbidity diagnosis, the ETG for that diagnosis is flagged or "turned on" in the comorbidity file. Then, during the execution of the Episode Definer Routine, all the patient's episodes with an ETG which can shift based on the presence of a comorbidity and which are "turned on" are appropriately shifted to the ETG "with comorbidity".

A loop beginning at step 282 is then executed to determine whether the ETG assigned by the first diagnosis code should be shifted to another ETG based upon the second, third and fourth diagnoses on record. At step 282, the second diagnosis is read from the patient's claim record and all valid ETGs for the second diagnosis are read from the dx-ETG table 201. A logical operand 284 is executed to determine whether one of the valid ETGs for the second diagnosis matches the primary diagnosis ETG. If a negative response is returned to logical operand 284, a loop back at step 285 is executed to step 282 for the next sequential diagnosis code on record, i.e., the third and forth diagnosis codes on record. If an affirmative response is returned to the logical operand 284, the a logical operand 286 queries the table value of the matched ETG to determine if a value of A is returned from the dx-ETG table. If a negative response is returned, the loop back step 285 is initialized. If an affirmative response is returned, the first dx ETG is flagged for change to a second dx ETG having an equivalent table value of C for the second diagnosis code on record at step 288 and all valid ETGs for the current diagnosis code on record are identified at step 290 from the dx-ETG table. The identified C-value ETG is then matched with any open active ETGs at step 292. Program operation then continues at bridge H 292 to Figure 4D.

At Figure 4D the continued operation of the Management Grouping Sub-routine from bridge H 292 of Figure 4C. Logical operand 296 queries the open active ETGs to determine whether a valid match with the identified C-value ETG exists. If a negative response is returned to logical operand 296, a value of 1 is added to the sequential episode count at step 297 and a new episode having a P value ETG is started in the patient's master active ETG file at step 299. The new episode is written with a sequential episode number, DOS-from and DOS-to values and forms a phantom management record. A phantom record is an anchor record, management or surgery, with more than one diagnosis, which is assigned to

one episode and its corresponding ETG based on one diagnosis, but can start a new episode(s) or update the most recent date of another active episode(s) based on other diagnoses on the record.

5 If an affirmative response is returned from logical operand 296, the matched active ETG with the most recent DOS-to value is selected at step 298. If a tie is found based upon most recent DOS-to values, then the most recent DOS-from value is selected for matching with active ETGs. If a tie is found at most recent DOS-from values is found, the first encountered ETG is selected and matched. The selected ETG's most recent DOS-to and sequential anchor count are updated in the patient's master active ETG file in step 300.

10 For either the new episode created at step 299 or the updated ETG from step 300, the patient's co-morbidity file is then updated with the second diagnosis code on-record at step 302. Processing then continues to identify all valid ETGs for a third diagnosis code on record at step 304 and the identified valid ETGs from step 304 are compared to the active ETGs in the patient's master active ETG file in step 306.

15 Bridge I 308 continues to Figure 4E, and a logical operand 310 is executed to query the patient's master active ETG file to determine whether a match exists between the valid ETGs identified in step 304 with any active ETG from the patients master active ETG file. If a negative response is returned to logical operand 310, a value of 1 is added to the sequential episode count at step 311 and a new episode having a P value ETG is started in the patient's master active ETG file at step 313. The new episode is written with a sequential episode number, DOS-from and DOS-to values and forms a phantom management record.

20 If an affirmative response is returned from logical operand 310, the matched active ETG with the most recent DOS-to value is selected at step 312. Again a decisional hierarchy is executed. If a tie is found based upon most recent DOS-to values, then the most recent DOS-from value is selected for matching with active ETGs. If a tie is found at most recent DOS-from values is found, the first encountered ETG is selected and matched. The selected ETG's most recent DOS-to and sequential anchor count are updated in the patient's master active ETG file in step 314.

25 For either the new episode created at step 311 or the updated ETG from step 314, the patient's co-morbidity file is then updated with the third diagnosis code on-record at step 316. Processing then continues to identify all valid ETGs for a fourth diagnosis code on

record at step 318 and the identified valid ETGs from step 3318 are compared to the active ETGs in the patient's master active ETG file in step 320. Bridge reference I 322, bridges to Figure 4F.

Turning to Figure 4F, a logical operand 324 is executed to query the patient's master active ETG file to determine whether a match exists between the valid ETGs identified in step 320 with any active ETG from the patients master active ETG file. If a negative response is returned to logical operand 324, a value of 1 is added to the sequential episode count at step 325 and a new episode having a P value ETG is started in the patient's master active ETG file at step 337. The new episode is written with a sequential episode number, DOS-from and DOS-to values and forms a phantom management record.

If an affirmative response is returned from logical operand 324, the matched active ETG with the most recent DOS-to value is selected at step 326. Again a decisional hierarchy is executed. If a tie is found based upon most recent DOS-to values, then the most recent DOS-from value is selected for matching with active ETGs. If a tie is found at most recent DOS-from values is found, the first encountered ETG is selected and matched. The selected ETG's most recent DOS-to and sequential anchor count are updated in the patient's master active ETG file in step 328.

For either the new episode created at step 337 or the updated ETG from step 324, the patient's co-morbidity file is then updated with the fourth diagnosis code on-record at step 330. A check is then made to determine whether the processed record is the last record for the patient by execution of logical operand 332 and reading the input claim records from the storage means. If logical operand 332 returns an affirmative value, the ETG Definer Sub-routine is called at step 334, as represented by bridge reference GG. If, however, a negative response is returned to logical operand 332, program execution returns to the step 204 of the Episode Assignor routine 200 and the next patient claim record is read from the storage means.

### Surgery Records

Grouping of Surgery Records to ETGs is governed by the Surgery Record Grouping Sub-routine 400, the operation of which is illustrated in Figures 5A-5D.

For those patient claim records identified as Surgery Records at step 208, the DOS-from value on-record is compared with the DOS-to value read from the patient master active ETG file at step 402. This identifies and flags those active ETGs which are to be closed, the flagged ETGs are then moved to the patient master closed ETG file. The first diagnosis code on-record is then read and compared to the dx-ETG table 201 to identify all possible valid ETGs for the first diagnosis code on-record in step 404.

Surgery records are coded with treatment codes (CPT codes). Each surgery record has a single CPT code value. The CPT code on-record is then read, and compared to a CPT by ETG table 401 previously written to the storage means. The CPT-ETG table will have pre-determined table values. For example, in accordance with the preferred embodiment of the invention, the CPT-ETG table 401 has table values of R, W and X, where R is a value shiftable to W and X is a validator value. All valid ETGs for the on-record CPT code are identified by this comparison at step 406. A logical operand 408 is then executed to determine whether there is a match of valid ETGs returned from the dx-ETG table 201 and the CPT-ETG table 401. If an affirmative response is returned to logical operand 408, a second logical operand 410 is executed to determine whether a match of valid specific ETGs exists. Again, if an affirmative response is returned from second logical operand 410, the valid specific ETGs matched in step 410 are then compared at step 414 with the open active ETGs for the patient read from the patient's master active ETG file at step 412. If an affirmative response is returned from step 414, the matched ETG with the most recent DOS-to is selected at step 416 and a value of 1 is added to the sequential anchor count in the selected ETG at step 418. In step 416, if a tie is found based upon most recent DOS-to values, then a decisional hierarchy is followed to select the most recent DOS-from value for matching with active ETGs. If a tie is found at most recent DOS-from values is found, the first encountered ETG is selected and matched.

If a negative response is returned to any of logical operands 408, 410 or 414, second, third and fourth dx codes on-record are read and all possible valid ETGs are read in step 411 from the dx-ETG table 201. Further processing of the valid ETGs output from step 411 is continued at Figure 5B identified by bridge reference P, 413.

Turning to Figure 5B, a logical operand 415 compares the valid ETGs for the second, third and fourth dx codes with the valid ETGs for the CPT code on-record in step 411. If a

negative response is returned from logical operand 415, the patient claim record is assigned to an ETG reserved for match errors between dx code and CPT code, e.g., ETG 998, and further processing of the match error ETG bridges at reference R, 431, to Figure 5D.

5 If an affirmative response is returned from logical operand 415, the matched ETGs are compared with active ETGs read from the patient master active ETG file at step 417 and logical operand 419 is executed at step 419 to determine whether any valid matches between matched ETGs and active ETGs. If a negative response is returned to logical operand 419, a value of 1 is added to the sequential anchor count and to the sequential episode count at step 425 and a new episode is started at step 437 with the first dx code on-record having a P value  
10 for a specific ETG in the dx-ETG table 201. If no specific ETG has a P value, a non-specific ETG having a P value for the dx code on record is used to start the new episode. The new episode is started by writing the sequential episode number, the sequential anchor count, the DOS-from and the DOS-to values on the record.

If an affirmative response is returned from logical operand 419, the matched specific  
15 ETG with the most recent DOS-to is selected at step 421. If a tie is found based upon most recent DOS-to values, then the most recent DOS-from value is selected for matching with active ETGs. If a tie is found at most recent DOS-from values is found, the first encountered ETG is selected and matched. A value of 1 is added to the sequential anchor count at step 423. Processing the new episode started at step 427 or of the selected matched specific ETG  
20 at step 421 continues to bridge Q, 420, continued at Figure 5C.

Turning to Figure 5C, bridged from reference Q, 420, logical operand 422 is executed which reads the CPT-ETG table 401 and determines the table value of the selected ETG from step 421 and step 427 based on the CPT value on-record. If a table value of R is returned from the read of the CPT-ETG table 401 at step 422, the matched ETG in the master active  
25 ETG file is shifted at step 424 to the ETG with an equivalent value of W for the CPT code on-record. If a table value of X or W is returned from step 422 or from step 242, the dx-ETG table 201 is read at step 426 and the dx code for the selected matched ETG from the CPT-ETG table 401 or the shifted ETG from step 424 is read. From the dx-ETG table 201, if a value of S is returned, the matched ETG in the patient master active ETG file is shifted at  
30 step 428 to the ETG with a table value of P for the dx code on-record. If a table value of A is returned, the matched ETG in the patient master active ETG file is changed in step 430 to

an equivalent value of C for the dx code on-record. If a table value of P, I or C is returned either from logical operand 426, or from the ETG change step 428 or the ETG shift step 430, the DOS-to and the sequential anchor count of the ETG in the patient master active ETG file are updated in step 432. The patient claim record is then assigned and written with the sequential episode number and the sequential anchor count of the selected ETG at step 434. The patient co-morbidity file is then updated with all diagnosis codes on-record at step 436.

Figure 5D bridges from Figure 5C with bridge reference BB, 438. In Figure 5D, the diagnosis codes on-record which were not used in the ETG selection described above, are then read from the patient claim record to identify all possible valid ETGs in the dx-ETG table 201. The identified possible valid ETGs are then matched against the patient master active ETG file in step 442 and logical operand 444 is executed to validate the matches. If an affirmative response is returned to logical operand 444, for each matched dx code on-record, the matched active ETG with the most recent DOS-to is selected at step 446. If a tie is found based upon most recent DOS-to values, then the most recent DOS-from value is selected for matching with active ETGs. If a tie is found at most recent DOS-from values is found, the first encountered ETG is selected and matched. The selected ETG's most recent DOS-to value is updated to the date of the patient medical claim, and the sequential anchor count in the active ETG is updated in step 448.

If a negative response is returned to logical operand 444, a value of 1 is added to sequential episode count at step 456 and a new episode having a P value ETG is started in the patient's master active ETG file at step 458. The new episode is written with a sequential episode number, DOS-from and DOS-to values and forms a phantom surgery record. If an affirmative response is returned to logical operand 444, the matched active ETG for each diagnosis code is selected at step 446 on the basis of the most recent DOS-to value. If a tie is found based upon most recent DOS-to values, then the most recent DOS-from value is selected for matching with active ETGs. If a tie is found at most recent DOS-from values is found, the first encountered ETG is selected and matched. The DOS-to field of the selected ETG from step 446 is updated in step 448 to the date of service on-record and the sequential anchor count in the active ETG file is updated. From either step 458 or from step 448, the patient co-morbidity file is updated to reference the selected ETG and a check is made to determine whether the patient claim record processed in step 429, which assigned an invalid

dx-CPT code match to the record, or from step 450, which updated the co-morbidity file, is the last record for the patient at logical operand 462. If an affirmative response is returned to logical operand 462, record processing proceeds to the Episode Definer Sub-routine at step 464, bridged by reference GG, to Figure 9. If, however, a negative response is returned to logical operand 462, a loop back 468 to the beginning of the ETG Assigner routine 200 is executed and the next patient claim record is read.

### Facility Records

The Facility Record Grouping Sub-routine 500 assigns facility records to ETGs on the basis of diagnosis codes on-record. The patient claim record is read and the first diagnosis code on-record is read to the dx-ETG table 201 to identify all valid ETGs for the first dx code at step 502. The identified valid ETGs are then compared to the open active ETGs in the patient master active ETG file in step 504. Logical operand 506 executes to determine whether any valid matches exist between identified ETGs for the dx code and the active ETGs for the patient. If a negative response is returned to step 506, a value of 1 is added to the sequential episode count at step 507 and a new episode is started in step 509 in the patient active ETG file with the ETG corresponding to the dx-ETG table value of P. If logical operand 507 returns an affirmative response, a query of the matched ETG value is made at step 508 to determine whether the matched ETG has a table value of P, C, A or S. If a negative response is returned to step 508, the matched active ETG with the most recent DOS-from value is selected at step 511. If a tie is found based upon most recent DOS-to values, then the most recent DOS-from value is selected for matching with active ETGs. If a tie is found at most recent DOS-from values is found, the first encountered ETG is selected and matched. If an affirmative response is returned at step 508, the table value of the matched ETG table value is identified at step 510. If the table value for the matched ETG in the dx-ETG table 201 is S, the matched ETG is shifted at step 514 to the ETG having a table value of P for the dx code. If the table value for the matched ETG returns a value of A, the matched ETG in the patient master active ETG file is changed at step 512 to an ETG having an equivalent table value of C for the dx code. If a table value of either P or C is returned at step 510, the most recent DOS-to is updated at step 516 in the ETG to the on-record claim

date. Further processing of the claim record from steps 509, 511 and 516 bridges at reference 1, 520, to Figure 6B.

Turning to Figure 6B, bridged from reference 1, 520, in Figure 6A, the patient's co-morbidity file is updated with the first dx code at step 522. A loop beginning at step 524 is then executed to determine whether the ETG assigned by the first diagnosis code should be shifted to another ETG based upon the second, third and fourth diagnoses on record. At step 524, the second diagnosis is read from the patient's claim record and all valid ETGs for the second diagnosis are read from the dx-ETG table 201. A logical operand 526 is executed to determine whether one of the valid ETGs for the second diagnosis matches the primary diagnosis ETG. If a negative response is returned to logical operand 526, a loop back at step 527 is executed to step 524 for the next sequential diagnosis code on record, i.e., the third and fourth diagnosis codes on record. If an affirmative response is returned to the logical operand 524, the logical operand 528 queries the table value of the matched ETG to determine if a value of A is returned from the dx-ETG table. If a negative response is returned, the loop back step 527 is initialized. If an affirmative response is returned, the first dx ETG is flagged for change to a second dx ETG having an equivalent table value of C for the second diagnosis code on record at step 530. All valid ETGs for the second diagnosis code on record are identified at step 532 from the dx-ETG table. The identified ETGs are then matched with any open active ETGs at step 532. Program operation then continues at bridge 2, 536 to Figure 6C.

At Figure 6C the continued operation of the Facility Record Grouping Sub-routine 500 from bridge 2 of Figure 6b is illustrated. Logical operand 538 queries the open active ETGs to determine whether a valid match with the identified ETGs exists. If a negative response is returned to logical operand 538, the patient co-morbidity file is updated with the second diagnosis code at step 544. If an affirmative response is returned from logical operand 538, the matched active ETG with the most recent DOS-to value is selected at step 540. If a tie is found based upon most recent DOS-to values, then the most recent DOS-from value is selected for matching with active ETGs. If a tie is found at most recent DOS-from values is found, the first encountered ETG is selected and matched. The selected ETG's most recent DOS-to and sequential anchor count are updated in the patient's master active ETG file in step 542.



Processing then continues to identify all valid ETGs for a third diagnosis code on record at step 546 and the identified valid ETGs from step 546 are compared to the active ETGs in the patient's master active ETG file in step 548.

5 Bridge 3, 550, continues to Figure 6D, and a logical operand 552 is executed to query the patient's master active ETG file to determine whether a match exists between the valid ETGs identified in step 548 with any active ETG from the patients master active ETG file. If a negative response is returned to logical operand 538, the patient's comorbidity file is updated with the third diagnosis code at 558.

10 If an affirmative response is returned from logical operand 552, the matched active ETG with the most recent DOS-to value is selected at step 554. Again a decisional hierarchy is executed. If a tie is found based upon most recent DOS-to values, then the most recent DOS-from value is selected for matching with active ETGs. If a tie is found at most recent DOS-from values is found, the first encountered ETG is selected and matched.

15 The patient's co-morbidity file is then updated with the third diagnosis code on-record at step 558. Processing then continues to identify all valid ETGs for a fourth diagnosis code on record at step 560 and the identified valid ETGs from step 3318 are compared to the active ETGs in the patient's master active ETG file in step 562. Bridge reference 4, 564, bridges to Figure 6D.

20 Turning to Figure 6D, a logical operand 566 is executed to query the patient's master active ETG file to determine whether a match exists between the valid ETGs identified in step 562 with any active ETG from the patients master active ETG file. If a negative response is returned to logical operand 566, the patient's comorbidity file is updated with the fourth diagnosis code.

25 If an affirmative response is returned from logical operand 566, the matched active ETG with the most recent DOS-to value is selected at step 568. In the event of a tie, a decisional hierarchy is executed. If a tie is found based upon most recent DOS-to values, then the most recent DOS-from value is selected for matching with active ETGs. If a tie is found at most recent DOS-from values is found, the first encountered ETG is selected and matched. The selected ETG's most recent DOS-to are updated in the patient's master active  
30 ETG file in step 570 and the patient's co-morbidity file is then updated with the fourth diagnosis code on-record at step 572. A check is then made to determine whether the

processed record is the last record for the patient by execution of logical operand 574 and reading the input claim records from the storage means. If logical operand 574 returns an affirmative value, the ETG Definer Sub-routine is called at step 576, as represented by bridge reference GG. If, however, a negative response is returned to logical operand 574, program  
5 execution returns to the step 204 of the Episode Assignor routine 200 and the next patient claim record is read from the storage means at step 578.

### Ancillary Records

Operation of the Ancillary Record Grouping Sub-routine 600 is illustrated in Figures 7A-7B. Like surgery records, ancillary records are grouped to ETGs on the basis of both dx  
10 codes and CPT code on record. First all valid ETGs for the treatment or CPT code on-record are identified in step 602 from the CPT-ETG table 401. Then all valid ETGs for the first dx code on record are identified in step 604 from the dx-ETG table 201. The ETGs from the CPT-ETG table 401 are then compared at step 606 to the ETGs from the dx-ETG table 201 and a logical operand 608 determines whether there is an ETG match. An affirmative  
15 response returned from logical operand 608 continues record processing at bridge D, 610, which continues on Figure 7B. A negative response returned from logical operand 608 prompts a look up on the dx-ETG table to determine all valid ETGs for the second diagnosis code on record in step 611. Step 613 again compares the valid ETGs for the CPT code on record and with the valid ETGs for the second dx code on record and a logical operand 614 is  
20 executed to match the second dx code ETG with the CPT code ETG. Again, an affirmative response returned from logical operand 614 continues record processing at bridge D, 610, which continues on Figure 7B. If a negative response is returned to logical operand 614, a look up on the dx-ETG table occurs to determine all valid ETGs for the third diagnosis code on record in step 615. Step 616 again compares the valid ETGs for the CPT code on record  
25 and with the valid ETGs for the third dx code on-record, which bridges E, 619, to Figure 7B for identification of all valid ETGs for the fourth dx code on-record at step 625.

Step 627 then compares the valid ETGs for the CPT code on record and with the valid ETGs for the fourth dx code on record and a logical operand 629 is executed to match the fourth dx code ETG with the CPT code ETG. An affirmative response returned from  
30 logical operand 629 continues to step 616 which compares the matched ETGs with the ETGs

in the patient master active ETG file and a query is made at logical operand 618 to determine whether any valid matches exist. If a negative response is returned to logical operand 629, the record is output to the ETG reserved for a CPT code-dx code mismatch at step 631 and a check is made at step 635 to determine whether the record is the last record for the patient.

5        If a match is found between the matched ETGs from the dx code-CPT code comparison in step 616. The matched active ETG with the most recent DOS-to value is selected. In the event of a tie, a decisional hierarchy is executed. If a tie is found based upon most recent DOS-to values, then the most recent DOS-from value is selected for matching with active ETGs. If a tie is found at most recent DOS-from values is found, the first  
10       encountered ETG is selected. The sequential episode number of the selected ETG is assigned to the record and the most recent sequential anchor count of the episode from the active ETG file is assigned to the record at step 622.

      If the response to logical operand 618 is negative, the record is assigned to an orphan record ETG at step 633 and maintained in the claims records until subsequent record  
15       processing either matches the record to an ETG or the orphan record DOS-from exceeds a one-year time period, at which time the record is output to an error log file.

      A check is then made to determine whether this record is the last record for the patient at step 635. If logical operand 635 returns an affirmative value, the ETG Definer Sub-routine is called at step 642, as represented by bridge reference GG. If, however, a  
20       negative response is returned to logical operand 635, program execution returns to the step 204 of the Episode Assignor routine 200 and the next patient claim record is read from the storage means at step 644.

### **Prescription Drug Records**

      Figures 8A-8C illustrate the operation of the Drug Record Grouping Sub-routine 700.  
25       Drug Record Grouping Sub-routine 700 references two predetermined tables previously written to the storage means. The first of the tables is a National Drug Code (NDC) by Generic Drug Code (GDC) table 800. This table acts as a translator table to translate a large number of NDCs to a smaller set of GDCs. A second pre-defined table is employed and is constructed as a GDC by ETG table 900. The GDC by ETG table is used, in conjunction

with the NDC by GDC translator table, to identify all valid ETGs for a particular NDC code in the claim record.

Once identified as a drug record in the initial operation of the Episode Assignor Routine 200, the drug record is read from storage to memory in step 702. The NDC code on-  
5 record is converted to a GDC code by reading from the NDC-GDC table 800 in step 704. Using the GDC number so identified, all possible valid ETGs for the GDC code are identified in step 706. The possible valid ETGs for the GDC code are then compared to the patient master active ETG file in step 708. Following bridge LL, 710, to Figure 8B, a logical operand is executed in step 712 based upon the comparison executed in step 708, to  
10 determine whether a match occurs having a table value of P, A, C or S.

If a negative response is returned to logical operand 712, a check is made to determine whether a match having table value I in the GDC-ETG table 900 exists in step 713. If another negative response is returned to logical operand 713, the record is flagged an orphan drug record and assigned to an orphan drug record ETG in step 715. If an affirmative  
15 response is returned to logical operand 713, the ETG with the highest second value is selected in step 718 (e.g. I1, I2, I3 and so on). If more than one ETG having the highest second value exists, the ETG having the most recent DOS-from value is selected. If a tie is again encountered, the first encountered ETG is selected. A sequential episode number and the most recent sequential anchor count of the episode from the patient master active ETG  
20 file is assigned to the drug record for the selected ETG in step 720.

If an affirmative response is returned to logical operand 712, the ETG having the highest second value, in order of P, S, A, C is selected in step 714 (e.g. P1, then P2... then S1, then S2... and so on). The record is then assigned a sequential episode number of the selected ETG and the most recent sequential anchor count of the episode from the patient  
25 master active ETG file in step 716.

Further processing of the drug record continues from steps 716, 715 and 720 through bridge MM, 724 and is described with reference to Figure 8C. A check is made in step 726 to determine whether the drug record is the last drug record for the patient on the record date. If a negative response is returned, a loop back to the top of the Drug Record Grouping Sub-  
30 routine 700 is executed. If an affirmative response is returned at step 726, a check is made to determine whether the drug record is the last record for the patient in step 728. If logical

operand 728 returns an affirmative value, the ETG Definer Sub-routine is called at step 732, as represented by bridge reference GG. If, however, a negative response is returned to logical operand 728, program execution returns to the step 204 of the Episode Assignor routine 200 and the next patient claim record is read from the storage means at step 730.

5       The Episode Definer Sub-routine is illustrated with reference to FIG. 9. Episode Definer Routine 118 is employed to assign all non-specific claims records, i.e., those initially assigned to ETG 900, to specific more appropriate ETGs. Episode Definer routine 750. Once all episodes have been grouped to ETGs, all ETG episodes in both active and closed ETGs are then identified in step 752 by patient age and presence or absence of a comorbidity. 10       The ETG number for each episode is then shifted and re-written to an ETG appropriate for the patient age and/or presence or absence of a comorbidity in step 754. All patient records are then output in step 756 to the display, to a file or to a printer, along with their shifted ETG number, sequential episode number of the record and in patient master active and closed ETG file for the patient. The Episode Definer routine 750 then writes a single record 15       at step 758 for each episode containing key analytical information, for example: the ETG number, patient age, patient sex, the sequential episode number, the total sum charges, the total sum paid, the earliest anchor record DOS-from value, the last anchor record DOS-to value, patient identification, physician identification, management charges, management charges paid, surgery charges, surgery charges paid, ancillary charges, and ancillary charges 20       paid.

      After the single record for each episode is written in step 758 for the patient, processing for the next patient begins by initialization of the next patient master active and closed ETG file, the next patient co-morbidity file, and the patient age file in step 760 and the Eligible Record Check Routine is re-initiated for processing claims records for the next 25       patient at step 762.

**Example:**

      Figure 10 provides an example of Management and Ancillary record clustering over a hypothetical time line for a single patient over a one year period from January, 1995 to December, 1995. Figure 10 depicts time frames of occurrences for claims classified as 30       management records, i.e., office visit 84, hospital or emergency room visit 85, and surgery

and surgical follow-up 86 and for claims records classified as ancillary records, *i.e.*, laboratory tests 87, X-ray and laboratory tests 88 and x-ray 89. Two time lines are provided. A first timeline 71 includes the diagnosis and the time duration of the diagnosed clinical condition. A second timeline 72 includes the claim events which gave rise to the medical claims. Where claim events occur more than once, an alphabetic designator is added to the reference numeral to denote chronological order of the event. For example, the first office visit is denoted 84a, the second office visit is denoted 84b, the third denoted 84c, etc. Vertical broken lines denote the beginning and end of each Episode Treatment Group 90, and facilitate correlation of the episode event, e.g., office visit, with the resulting diagnosis, e.g., bronchitis.

A first office visit 84a resulted in a diagnosis of bronchitis 76. Office visit 84a started an episode 90a for this patient based upon the bronchitis diagnosis 76. A second office visit 84b occurred concurrently with the bronchitis episode 90a, but resulted in a diagnosis of eye infection 77. Because the eye infection 77 is unrelated to the open bronchitis episode ETG 90a, a new eye infection episode ETG 90b is started. An X-ray and lab test 88 was taken during the time frame of each of the bronchitis episode 90a and the eye infection 90b. Based upon the CPT-ETG table, discussed above, the X-ray and lab test 88 is assigned to the eye infection episode 90b. A third office visit 84c and x-ray 89a occurred and related to the bronchitis episode 90a rather than the eye infection episode 90b.

A fourth office visit 84d occurred and resulted in a diagnosis of major infection 78 unrelated to the bronchitis diagnosis 76. Because the major infection 78 is unrelated to the bronchitis, the fourth office visit 84d opened a new ETG 90c. Two subsequent lab tests 87a and 87b were both assigned to the only open episode, *i.e.*, ETG 90c.

A fifth office visit 84e resulted in a diagnosis of benign breast neoplasm 79, which is unrelated to the major infection ETG 90c. A fifth office visit 84e opened a new ETG 90d because the benign breast neoplasm is unrelated to either the bronchitis episode ETG 90a, the eye infection episode ETG 90b, or the major infection episode 90c. Sixth office visit 84f was assigned then to the only open episode, *i.e.*, ETG 90d. Similarly, the surgery and follow-up records 86a and 86b related to the benign neoplasm ETG 90d and are grouped to that ETG.

Some months later, the patient has a seventh office visit 84g which resulted in a diagnosis of bronchitis 80. However, because the time period between the prior bronchitis episode 76 and the current bronchitis episode 80 exceeds a pre-determined period of time in which there was an absence of treatment for bronchitis, the bronchitis episode 90a is closed and the bronchitis episode 90e is opened. A hospital record 85 occurs as a result of an eye trauma and eye trauma 81 is the resulting diagnosis. Because the eye trauma 85 is unrelated to the bronchitis 80, a new eye trauma ETG 90f is started which is open concurrently with the bronchitis ETG 90e. An eighth office visit 84h occurs during the time when both ETG 90e and ETG 90f are open. Eighth office visit 84h is, therefore, grouped to the ETG most relevant to the office visit 84h, i.e., ETG 90e. A subsequent x-ray record 89b occurs and is related to the eye trauma diagnosis and is, therefore, grouped to ETG 90f. Because and absence of treatment has occurred for the bronchitis ETG 90e, that ETG 90e is closed.

Finally, while the eye trauma ETG 90f is open, the patient has a routine office visit 84h which is unrelated to the open ETG 90f for the eye trauma diagnosis 91. Because it is unrelated to the open ETG 90f, the routine office visit 84i starts and groups to a new episode 90g which contains only one management record 84i. An x-ray record 89c occurs after and is unrelated to the routine office visit 84i. The only open episode is the eye trauma episode 90f and the x-ray record 89c is, therefore, grouped to the eye trauma episode 90f. At the end of the year, all open episodes, i.e., the eye trauma ETG 90f are closed.

It will be apparent to those skilled in the art, that the foregoing detailed description of the preferred embodiment of the present invention is representative of a type of health care system within the scope and spirit of the present invention. Further, those skilled in the art will recognize that various changes and modifications may be made without departing from the true spirit and scope of the present invention. Those skilled in the art will recognize that the invention is not limited to the specifics as shown here, but is claimed in any form or modification falling within the scope of the appended claims. For that reason, the scope of the present invention is set forth in the following claims.

## APPENDIX 1

ETG	DESCRIPTION
1	AIDS with major infectious complication
2	AIDS with minor infectious complication
5 3	AIDS with inflammatory complication
4	AIDS with neoplastic complication, with surgery
5	AIDS with neoplastic complication, w/o surgery
6	HIV sero-positive without AIDS
7	Major infectious disease except HIV, with comorbidity
10 8	Septicemia, w/o comorbidity
9	Major infectious disease except HIV and septicemia, w/o comorbidity
10	Minor infectious disease
11	Infectious disease signs & symptoms
20	Diseases of the thyroid gland, with surgery
15 21	Hyper-functioning thyroid gland
22	Hypo-functioning thyroid gland
23	Non-toxic goiter
24	Malignant neoplasm of the thyroid gland
25	Benign neoplasm of the thyroid gland
20 26	Other diseases of the thyroid gland
27	Insulin dependent diabetes, with comorbidity
28	Insulin dependent diabetes, w/o comorbidity
29	Non-insulin dependent diabetes, with comorbidity
30	Non-insulin dependent diabetes, w/o comorbidity
25 31	Malignant neoplasm of the pancreatic gland
32	Benign endocrine disorders of the pancreas
33	Malignant neoplasm of the pituitary gland
34	Benign neoplasm of the pituitary gland
35	Hyper-functioning adrenal gland
30 36	Hypo-functioning adrenal gland
37	Malignant neoplasm of the adrenal gland
38	Benign neoplasm of the adrenal gland
39	Hyper-functioning parathyroid gland
40	Hypo-functioning parathyroid gland
35 41	Malignant neoplasm of the parathyroid gland
42	Benign neoplasm of the parathyroid gland
43	Female sex gland disorders
44	Male sex gland disorders
45	Nutritional deficiency
40 46	Gout
47	Metabolic deficiency except gout



ETG	DESCRIPTION
48	Other diseases of the endocrine glands or metabolic disorders, with surgery
49	Other diseases of the endocrine glands or metabolic disorders, w/o surgery
50	Endocrine disease signs & symptoms
70	Leukemia with bone marrow transplant
5 71	Leukemia with splenectomy
72	Leukemia w/o splenectomy
73	Neoplastic disease of blood and lymphatic system except leukemia
74	Non-neoplastic blood disease with splenectomy
75	Non-neoplastic blood disease, major
10 76	Non-neoplastic blood disease, minor
77	Hematology signs & symptoms
90	Senile or pre-senile mental condition
91	Organic drug or metabolic disorders
92	Autism and childhood psychosis
15 93	Inorganic psychoses except infantile autism
94	Neuropsychological & behavioral disorders
95	Personality disorder
96	Mental disease signs & symptoms
110	Cocaine or amphetamine dependence with complications age less than 16
20 111	Cocaine or amphetamine dependence with complications age 16+
112	Cocaine or amphetamine dependence w/o complications age less than 16
113	Cocaine or amphetamine dependence w/o complications age 16+
114	Alcohol dependence with complications, age less than 16
115	Alcohol dependence with complications, age 16+
25 116	Alcohol dependence w/o complications, age less than 16
117	Alcohol dependence w/o complications, age 16+
118	Opioid and/or barbiturate dependence, age less than 16
119	Opioid and/or barbiturate dependence, age 16+
120	Other drug dependence, age less than 16
30 121	Other drug dependence, age 16 +
140	Viral meningitis
141	Bacterial and fungal meningitis
142	Viral encephalitis
143	Non-viral encephalitis
35 144	Parasitic encephalitis
145	Toxic encephalitis
146	Brain abscess, with surgery
147	Brain abscess, w/o surgery
148	Spinal abscess
40 149	Inflammation of the central nervous system, with surgery
150	Inflammation of the central nervous system, w/o surgery
151	Epilepsy, with surgery

	ETG	DESCRIPTION
	152	Epilepsy, w/o surgery
	153	Malignant neoplasm of the central nervous system, with surgery
	154	Malignant neoplasm of the central nervous system, w/o surgery
5	155	Benign neoplasm of the central nervous system, with surgery
	156	Benign neoplasm of the central nervous system, w/o surgery
	157	Cerebral vascular accident, hemorrhagic, with surgery
	158	Cerebral vascular accident, hemorrhagic, w/o surgery
	159	Cerebral vascular accident, non-hemorrhagic, with surgery
10	160	Cerebral vascular accident, non-hemorrhagic, w/o surgery
	161	Major brain trauma, with surgery
	162	Major brain trauma, w/o surgery
	163	Minor brain trauma
	164	Spinal trauma, with surgery
	165	Spinal trauma, w/o surgery
15	166	Hereditary and degenerative diseases of the central nervous system, with surgery
	167	Hereditary and degenerative diseases of the central nervous system, w/o surgery
	168	Migraine headache, non-intractable
	169	Migraine headache, intractable
	170	Congenital and other disorders of the central nervous system, with surgery
20	171	Congenital and other disorders of the central nervous system, w/o surgery
	172	Inflammation of the cranial nerves, with surgery
	173	Inflammation of the cranial nerves, w/o surgery
	174	Carpal tunnel syndrome, with surgery
	175	Carpal tunnel syndrome, w/o surgery
25	176	Inflammation of the non-cranial nerves, except carpal tunnel, with surgery
	177	Inflammation of the non-cranial nerves, except carpal tunnel, w/o surgery
	178	Peripheral nerve neoplasm, with surgery
	179	Peripheral nerve neoplasm, w/o surgery
	180	Traumatic disorder of the cranial nerves, with surgery
30	181	Traumatic disorder of the cranial nerves, w/o surgery
	182	Traumatic disorder of the non-cranial nerves, with surgery
	183	Traumatic disorder of the non-cranial nerves, w/o surgery
	184	Congenital disorders of the peripheral nerves
	185	Neurological disease signs & symptoms
35	200	Internal eye infection with surgery
	201	Internal eye infection w/o surgery
	202	External eye infection, with surgery
	203	External eye infection, except conjunctivitis, w/o surgery
	204	Conjunctivitis
40	205	Inflammatory eye disease, with surgery
	206	Inflammatory eye disease, w/o surgery
	207	Malignant neoplasm of the eye, internal, with surgery

ETG	DESCRIPTION
208	Malignant neoplasm of the eye, internal, w/o surgery
209	Malignant neoplasm of the eye, external
210	Benign neoplasm of the eye, internal
211	Benign neoplasm of the eye, external
5 212	Glaucoma, closed angle with surgery
213	Glaucoma, closed angle w/o surgery
214	Glaucoma, open angle, with surgery
215	Glaucoma, open angle, w/o surgery
216	Cataract, with surgery
10 217	Cataract, w/o surgery
218	Trauma of the eye, with surgery
219	Trauma of the eye, w/o surgery
220	Congenital anomaly of the eye, with surgery
221	Congenital anomaly of the eye, w/o surgery
15 222	Diabetic retinopathy, with surgery
223	Diabetic retinopathy, w/o surgery with comorbidity
224	Diabetic retinopathy, w/o surgery w/o comorbidity
225	Non-diabetic vascular retinopathy, with surgery
226	Non-diabetic vascular retinopathy, w/o surgery
20 227	Other vascular disorders of the eye except retinopathies, with surgery
228	Other vascular disorders of the eye except retinopathies, w/o surgery
229	Macular degeneration, with surgery
230	Macular degeneration, w/o surgery
231	Non-macular degeneration, with surgery
25 232	Non-macular degeneration, w/o surgery
233	Major visual disturbances, with surgery
234	Major visual disturbances, w/o surgery
235	Minor visual disturbances, with surgery
236	Minor visual disturbances, w/o surgery
30 237	Other diseases and disorders of the eye and adnexa
250	Heart transplant
251	AMI, with coronary artery bypass graft
252	AMI or acquired defect, with valvular procedure
253	AMI, with angioplasty
35 254	AMI with arrhythmia, with pacemaker implant
255	AMI, with cardiac catheterization
256	AMI, anterior wall with complication
257	AMI, anterior wall w/o complication
258	AMI, inferior wall with complication
40 259	AMI, inferior wall w/o complication
260	Ischemic heart disease, w/o AMI, with coronary artery bypass graft
261	Ischemic heart disease, w/o AMI, with valvular procedure

ETG	DESCRIPTION
262	Ischemic heart disease, w/o AMI, with angioplasty
263	Ischemic heart disease, w/o AMI, with arrhythmia, with pacemaker implant
264	Ischemic heart disease, w/o AMI, with cardiac catheterization
265	Ischemic heart disease, w/o AMI
5 266	Pulmonary heart disease, w/o AMI
267	Aortic aneurysm, with surgery
268	Aortic aneurysm, w/o surgery
269	Cardiac infection, with surgery
270	Cardiac infection, w/o surgery
10 271	Valvular disorder, with complication
272	Valvular disorder, w/o complication
273	Major conduction disorder, with pacemaker/defibrillator implant
274	Major conduction disorder, w/o pacemaker/defibrillator implant
275	Minor conduction disorder
15 276	Malignant hypertension with comorbidity
277	Malignant hypertension w/o comorbidity
278	Benign hypertension with comorbidity
279	Benign hypertension w/o comorbidity
280	Cardiac congenital disorder, with surgery
20 281	Cardiac congenital disorder, w/o surgery
282	Major cardiac trauma, with surgery
283	Major cardiac trauma, w/o surgery
284	Minor cardiac trauma
285	Other cardiac diseases
25 286	Arterial inflammation, with surgery
287	Major arterial inflammation, w/o surgery
288	Minor arterial inflammation, w/o surgery
289	Major non-inflammatory arterial disease with surgery
290	Arterial embolism/thrombosis, w/o surgery
30 291	Major non-inflammatory arterial disease, except embolism/thrombosis, w/o surgery
292	Atherosclerosis, with surgery
293	Atherosclerosis, w/o surgery
294	Arterial aneurysm, except aorta, with surgery
295	Arterial aneurysm, except aorta, w/o surgery
35 296	Other minor non-inflammatory arterial disease, with surgery
297	Other minor non-inflammatory arterial disease, w/o surgery
298	Arterial trauma, with surgery
299	Arterial trauma, w/o surgery
300	Vein inflammation, with surgery
40 301	Embolism and thrombosis of the veins
302	Disorder of the lymphatic channels
303	Phlebitis and thrombophlebitis of the veins

	ETG	DESCRIPTION
	304	Varicose veins of the lower extremity
	305	Other minor inflammatory disease of the veins
	306	Venous trauma, with surgery
	307	Venous trauma, w/o surgery
5	308	Other diseases of the veins
	309	Cardiovascular disease signs & symptoms
	320	Infection of the oral cavity
	321	Inflammation of the oral cavity, with surgery
	322	Inflammation of the oral cavity, w/o surgery
10	323	Trauma of the oral cavity, with surgery
	324	Trauma of the oral cavity, w/o surgery
	325	Other diseases of the oral cavity, with surgery
	326	Other diseases of the oral cavity, w/o surgery
	327	Otitis media, with major surgery
15	328	Otitis media, with minor surgery
	329	Otitis media, w/o surgery
	330	Tonsillitis, adenoiditis or pharyngitis, with surgery
	331	Tonsillitis, adenoiditis or pharyngitis, w/o surgery
	332	Sinusitis and Rhinitis, with surgery
20	333	Sinusitis and Rhinitis, w/o surgery
	334	Other ENT infection, with surgery
	335	Other ENT infection, w/o surgery
	336	Major ENT inflammatory conditions with surgery
	337	Major ENT inflammatory conditions w/o surgery
25	338	Minor ENT inflammatory conditions with surgery
	339	Minor ENT inflammatory conditions w/o surgery
	340	ENT malignant neoplasm, with surgery
	341	ENT malignant neoplasm, w/o surgery
	342	ENT benign neoplasm, with surgery
30	343	ENT benign neoplasm, w/o surgery
	344	ENT congenital anomalies, with surgery
	345	ENT congenital anomalies, w/o surgery
	346	Hearing disorders, with surgery
	347	Hearing disorders, w/o surgery
35	348	ENT trauma, with surgery
	349	ENT trauma, w/o surgery
	350	Other ENT disorders, with surgery
	351	Other ENT disorders, w/o surgery
	352	Otolaryngology disease signs & symptoms
40	371	Viral pneumonia, with comorbidity
	372	Viral pneumonia, w/o comorbidity
	373	Bacterial lung infections, with comorbidity

ETG	DESCRIPTION
374	Bacterial lung infections, w/o comorbidity
375	Fungal and other pneumonia, with comorbidity
376	Fungal and other pneumonia, w/o comorbidity
377	Pulmonary TB with comorbidity
5 378	Pulmonary TB w/o comorbidity
379	Disseminated TB with comorbidity
380	Disseminated TB w/o comorbidity
381	Acute bronchitis, with comorbidity, age less than 5
382	Acute bronchitis, with comorbidity, age 5+
10 383	Acute bronchitis, w/o comorbidity, age less than 5
384	Acute bronchitis, w/o comorbidity, age 5+
385	Minor infectious pulmonary disease other than acute bronchitis
386	Asthma with comorbidity, age less than 18
387	Asthma with comorbidity, age 18+
15 388	Asthma w/o comorbidity, age less than 18
389	Asthma w/o comorbidity, age 18+
390	Chronic bronchitis, with complication with comorbidity
391	Chronic bronchitis with complication w/o comorbidity
392	Chronic bronchitis, w/o complication with comorbidity
20 393	Chronic bronchitis w/o complication w/o comorbidity
394	Emphysema, with comorbidity
395	Emphysema w/o comorbidity
396	Occupational and environmental pulmonary diseases, with comorbidity
397	Occupational and environmental pulmonary diseases, w/o comorbidity
25 398	Other inflammatory lung disease, with surgery
399	Other inflammatory lung disease, w/o surgery
400	Malignant pulmonary neoplasm, with surgery
401	Malignant pulmonary neoplasm, w/o surgery
402	Benign pulmonary neoplasm, with surgery
30 403	Benign pulmonary neoplasm, w/o surgery
404	Chest trauma, with surgery
405	Chest trauma, open, w/o surgery
406	Chest trauma, closed, w/o surgery
407	Pulmonary congenital anomalies, with surgery
35 408	Pulmonary congenital anomalies, w/o surgery
409	Other pulmonary disorders
410	Pulmonology disease signs & symptoms
430	Infection of the stomach and esophagus with comorbidity
431	Infection of the stomach and esophagus w/o comorbidity
40 432	Inflammation of the esophagus, with surgery
433	Inflammation of the esophagus, w/o surgery
434	Gastritis and/or duodenitis, complicated

ETG	DESCRIPTION
435	Gastritis and/or duodenitis, simple
436	Ulcer, complicated with surgery
437	Ulcer, complicated w/o surgery
438	Ulcer, simple
5 439	Malignant neoplasm of the stomach and esophagus, with surgery
440	Malignant neoplasm of the stomach and esophagus, w/o surgery
441	Benign neoplasm of the stomach and esophagus, with surgery
442	Benign neoplasm of the stomach and esophagus, w/o surgery
443	Trauma or anomaly of the stomach or esophagus, with surgery
10 444	Trauma of the stomach or esophagus, w/o surgery
445	Anomaly of the stomach or esophagus, w/o surgery
446	Appendicitis, with rupture
447	Appendicitis, w/o rupture
448	Diverticulitis, with surgery
15 449	Diverticulitis, w/o surgery
450	Other infectious diseases of the intestines and abdomen
451	Inflammation of the intestines and abdomen with surgery
452	Inflammation of the intestines and abdomen, w/o surgery
453	Malignant neoplasm of the intestines and abdomen, with surgery
20 454	Malignant neoplasm of the intestines and abdomen, w/o surgery
455	Benign neoplasm of the intestines and abdomen, with surgery
456	Benign neoplasm of the intestines and abdomen, w/o surgery
457	Trauma of the intestines and abdomen, with surgery
458	Trauma of the intestines and abdomen, w/o surgery
25 459	Congenital anomalies of the intestines and abdomen, with surgery
460	Congenital anomalies of the intestines and abdomen, w/o surgery
461	Vascular disease of the intestines and abdomen
462	Bowel obstruction with surgery
463	Bowel obstruction w/o surgery
30 464	Irritable bowel syndrome
465	Hernias, except hiatal, with surgery
466	Hernias, except hiatal, w/o surgery
467	Hiatal hernia, with surgery
468	Hiatal hernia, w/o surgery
35 469	Other diseases of the intestines and abdomen
470	Infection of the rectum or anus, with surgery
471	Infection of the rectum or anus, w/o surgery
472	Hemorrhoids, complicated, with surgery
473	Hemorrhoids, complicated, w/o surgery
40 474	Hemorrhoids, simple
475	Inflammation of the rectum or anus, with surgery
476	Inflammation of the rectum or anus, w/o surgery

	ETG	DESCRIPTION
	477	Malignant neoplasm of the rectum or anus, with surgery
	478	Malignant neoplasm of the rectum or anus, w/o surgery
	479	Benign neoplasm of the rectum or anus, with surgery
	480	Benign neoplasm of the rectum or anus, w/o surgery
5	481	Trauma of the rectum or anus, open, with surgery
	482	Trauma of the rectum or anus, open, w/o surgery
	483	Trauma of the rectum or anus, closed
	484	Other diseases and disorders of the rectum and anus, with surgery
	485	Other diseases and disorders of the rectum and anus, w/o surgery
10	486	Gastroenterology disease signs & symptoms
	510	Liver Transplant
	511	Infectious hepatitis, high severity with comorbidity
	512	Infectious hepatitis, high severity w/o comorbidity
	513	Infectious hepatitis, low severity with comorbidity
15	514	Infectious hepatitis, low severity w/o comorbidity
	515	Non-infectious hepatitis, with complications
	516	Non-infectious hepatitis, w/o complications
	517	Cirrhosis, with surgery
	518	Cirrhosis, w/o surgery
20	519	Acute pancreatitis
	520	Chronic pancreatitis
	521	Cholelithiasis, complicated
	522	Cholelithiasis, simple, with surgery
	523	Cholelithiasis, simple, w/o surgery
25	524	Malignant neoplasm of the hepato-biliary system, with surgery
	525	Malignant neoplasm of the hepato-biliary system, w/o surgery
	526	Benign neoplasm of the hepato-biliary system, with surgery
	527	Benign neoplasm of the hepato-biliary system, w/o surgery
	528	Trauma of the hepato-biliary system, complicated, with surgery
30	529	Trauma of the hepato-biliary system, complicated, w/o surgery
	530	Trauma of the hepato-biliary system, simple
	531	Other diseases of the hepato-biliary system, with surgery
	532	Other diseases of the hepato-biliary system, w/o surgery
	533	Hepatology disease signs & symptoms
35	550	Kidney Transplant
	551	Acute renal failure, with comorbidity
	552	Acute renal failure, w/o comorbidity
	553	Chronic renal failure, with ESRD
	554	Chronic renal failure, w/o ESRD
40	555	Acute renal inflammation, with comorbidity
	556	Acute renal inflammation, w/o comorbidity
	557	Chronic renal inflammation, with surgery



ETG	DESCRIPTION
558	Chronic renal inflammation, w/o surgery
559	Nephrotic syndrome, minimal change
560	Nephrotic syndrome
561	Other renal conditions
5	562 Nephrology disease signs & symptoms
570	Infection of the genitourinary system with surgery
571	Infection of the genitourinary system w/o surgery
572	Sexually transmitted infection of the lower genitourinary system
573	Infection of the lower genitourinary system, not sexually transmitted
10	574 Kidney stones, with surgery with comorbidity
575	Kidney stones, with surgery w/o comorbidity
576	Kidney stones, w/o surgery with comorbidity
577	Kidney stones, w/o surgery w/o comorbidity
578	Inflammation of the genitourinary tract except kidney stones, with surgery
15	579 Inflammation of the genitourinary tract except kidney stones, w/o surgery
580	Malignant neoplasm of the prostate, with surgery
581	Malignant neoplasm of the prostate, w/o surgery
582	Benign neoplasm of the prostate, with surgery
583	Benign neoplasm of the prostate, w/o surgery
20	584 Malignant neoplasm of the genitourinary tract, except prostate, with surgery
585	Malignant neoplasm of the genitourinary tract, except prostate, w/o surgery
586	Benign neoplasm of the genitourinary tract, except prostate with surgery
587	Benign neoplasm of the genitourinary tract, except prostate, w/o surgery
588	Trauma to the genitourinary tract, with surgery
25	589 Trauma to the genitourinary tract, w/o surgery
590	Urinary incontinence, with surgery
591	Urinary incontinence, w/o surgery
592	Other diseases of the genitourinary tract, with surgery
593	Other diseases of the genitourinary tract, w/o surgery
30	594 Urological disease signs & symptoms
610	Normal pregnancy, normal labor & delivery, with cesarean section
611	Normal pregnancy, normal labor & delivery, w/o cesarean section
612	Complicated pregnancy, with cesarean section
613	Complicated pregnancy, w/o cesarean section
35	614 Hemorrhage during pregnancy, with cesarean section
615	Hemorrhage during pregnancy, w/o cesarean section
616	Other condition during pregnancy, with cesarean section
617	Other condition during pregnancy, w/o cesarean section
618	Fetal problems during pregnancy, with cesarean section
40	619 Fetal problems during pregnancy, w/o cesarean section
620	Ectopic pregnancy, with surgery
621	Ectopic pregnancy, w/o surgery

	ETG	DESCRIPTION
	622	Spontaneous abortion
	623	Non-spontaneous abortion
	624	Obstetric signs & symptoms
	630	Infection of the ovary and/or fallopian tube, with surgery
5	631	Infection of the ovary and/or fallopian tube, w/o surgery, with comorbidity
	632	Infection of the ovary and/or fallopian tube, w/o surgery, w/o comorbidity
	633	Infection of the uterus, with surgery
	634	Infection of the uterus, w/o surgery, with comorbidity
	635	Infection of the uterus, w/o surgery, w/o comorbidity
10	636	Infection of the cervix, with surgery
	637	Infection of the cervix, w/o surgery
	638	Vaginal infection, with surgery
	639	Monilial infection of the vagina (yeast)
	640	Infection of the vagina except monilial
15	641	Inflammation of the female genital system, with surgery
	642	Endometriosis, w/o surgery
	643	Inflammatory condition of the female genital tract except endometriosis, w/o surgery
	644	Malignant neoplasm of the female genital tract, with surgery
	645	Malignant neoplasm of the female genital tract, w/o surgery
20	646	Benign neoplasm of the female genital tract, with surgery
	647	Benign neoplasm of the female genital tract, w/o surgery
	648	Conditions associated with menstruation, with surgery
	649	Conditions associated with menstruation, w/o surgery
	650	Conditions associated with female infertility, with surgery
25	651	Conditions associated with female infertility, w/o surgery
	652	Other diseases of the female genital tract, with surgery
	653	Other diseases of the female genital tract, w/o surgery
	654	Malignant neoplasm of the breast, with surgery
	655	Malignant neoplasm of the breast, w/o surgery
30	656	Benign neoplasm of the breast, with surgery
	657	Benign neoplasm of the breast, w/o surgery
	658	Other disorders of the breast, with surgery
	659	Other disorders of the breast, w/o surgery
	660	Gynecological signs & symptoms
35	670	Major bacterial infection of the skin, with surgery
	671	Major bacterial infection of the skin, w/o surgery
	672	Minor bacterial infection of the skin
	673	Viral skin infection
	674	Fungal skin infection, with surgery
40	675	Fungal skin infection, w/o surgery
	676	Parasitic skin infection
	677	Major inflammation of skin & subcutaneous tissue

ETG	DESCRIPTION
678	Minor inflammation of skin & subcutaneous tissue
679	Malignant neoplasm of the skin, major, with surgery
680	Malignant neoplasm of the skin, major, w/o surgery
681	Malignant neoplasm of the skin, minor
5 682	Benign neoplasm of the skin
683	Major burns, with surgery
684	Major burns, w/o surgery
685	Major skin trauma, except burns, with surgery
686	Major skin trauma, except burns, w/o surgery
10 687	Minor burn
688	Minor trauma of the skin except burn, with surgery
689	Open wound of the skin, w/o surgery
690	Minor trauma of the skin except burn and open wound, w/o surgery
691	Other skin disorders
15 692	Dermatological signs & symptoms
710	Infection of the large joints with comorbidity
711	Infection of the large joints w/o comorbidity
712	Infection of the small joints with comorbidity
713	Infection of the small joints w/o comorbidity
20 714	Degenerative orthopedic diseases with hip or spine surgery
715	Degenerative orthopedic diseases with large joint surgery
716	Degenerative orthopedic diseases with hand or foot surgery
717	Juvenile rheumatoid arthritis with complication with comorbidity
718	Juvenile rheumatoid arthritis with complication w/o comorbidity
25 719	Juvenile rheumatoid arthritis w/o complication with comorbidity
720	Juvenile rheumatoid arthritis w/o complication w/o comorbidity
721	Adult rheumatoid arthritis with complication with comorbidity
722	Adult rheumatoid arthritis with complication w/o comorbidity
723	Adult rheumatoid arthritis w/o complication with comorbidity
30 724	Adult rheumatoid arthritis w/o complication w/o comorbidity
725	Lupus, with complication
726	Lupus, w/o complication
727	Autoimmune rheumatologic disease except lupus
728	Inflammation of the joints other than rheumatoid arthritis, with comorbidity
35 729	Inflammation of the joints other than rheumatoid arthritis, w/o comorbidity
730	Degenerative joint disease, generalized
731	Degenerative joint disease, localized with comorbidity
732	Degenerative joint disease, localized w/o comorbidity
733	Infections of bone, with surgery
40 734	Infections of bone, w/o surgery
735	Maxillofacial fracture or dislocation, with surgery
736	Maxillofacial fracture or dislocation, w/o surgery

ETG	DESCRIPTION
737	Pelvis fracture or dislocation, with surgery
738	Pelvis fracture or dislocation, w/o surgery
739	Hip and/or femur fracture or dislocation, with surgery
740	Hip and/or femur fracture or dislocation, open, w/o surgery
5	741 Hip and/or femur fracture or dislocation, closed, w/o surgery
742	Upper extremity fracture or dislocation, with surgery
743	Upper extremity fracture or dislocation, open, w/o surgery
744	Upper extremity fracture or dislocation, closed, w/o surgery
745	Lower extremity fracture or dislocation, with surgery
10	746 Lower extremity fracture or dislocation, open, w/o surgery
747	Lower extremity fracture or dislocation, closed, w/o surgery
748	Trunk fracture or dislocation, with surgery
749	Trunk fracture or dislocation, open, w/o surgery
750	Trunk fracture or dislocation, closed, w/o surgery
15	751 Malignant neoplasm of the bone and connective tissue, head and neck
752	Malignant neoplasm of the bone and connective tissue other than head and neck
753	Benign neoplasm of the bone and connective tissue, head and neck
754	Benign neoplasm of the bone and connective tissue other than head and neck
755	Internal derangement of joints, with surgery
20	756 Internal derangement of joints, w/o surgery
757	Major orthopedic trauma other than fracture or dislocation, with surgery
758	Major orthopedic trauma other than fracture or dislocation, w/o surgery
759	Major neck and back disorders, with surgery
760	Major neck and back disorders, w/o surgery
25	761 Bursitis and tendinitis, with surgery
762	Bursitis and tendinitis, w/o surgery
763	Minor orthopedic disorder except bursitis and tendinitis, with surgery
764	Minor neck and back disorder, except bursitis and tendinitis, w/o surgery
765	Minor orthopedic disorder other than neck and back, except bursitis and tendinitis, w/o surgery
30	766 Orthopedic congenital and acquired deformities, with surgery
767	Orthopedic congenital and acquired deformities, w/o surgery
768	Orthopedic and rheumatological signs & symptoms
780	Uncomplicated neonatal management
781	Chromosomal anomalies
35	782 Metabolic related disorders originating the antenatal period
783	Chemical dependency related disorders originating in the antenatal period
784	Mechanical related disorders originating in the antenatal period
785	Other disorders originating in the antenatal period
786	Other major neonatal disorders, perinatal origin
40	787 Other minor neonatal disorders, perinatal origin
788	Neonatal signs & symptoms

	ETG	DESCRIPTION
	790	Exposure to infectious diseases
	791	Routine inoculation
	792	Non-routine inoculation
	793	Prophylactic procedures other than inoculation and exposure to infectious disease
5	794	Routine exam
	795	Contraceptive management, with surgery
	796	Contraceptive management, w/o surgery
	797	Conditional exam
	798	Major specific procedures not classified elsewhere
10	799	Minor specific procedures not classified elsewhere
	800	Administrative services
	801	Other preventative and administrative services
	810	Late effects and late complications
	811	Environmental trauma
15	812	Poisonings and toxic effects of drugs
	900	Isolated signs, symptoms and non-specific diagnoses or conditions
	990	Drug record, no drug module
	991	Orphan drug record
	992	Non-Rx NDC code
20	993	Invalid NDC code
	994	Invalid provider type, e.g., dentist
	995	Record outside date range
	996	Invalid CPT-4 code
	997	Invalid Dx code
25	998	Inappropriate Dx-CPT-4 matched record
	999	Orphan record

I Claim:

- 1           1.     A computer-implemented process for profiling medical claims including the steps  
2     of:
  - 3           (a)     reading a first patient's medical claim data, input as at least one of a plurality of  
4     data records, into a computer memory;
  - 5           (b)     validating each of said at least one of a plurality of data records for at least one  
6     of a diagnosis code and a treatment code;
  - 7           (c)     identifying said at least one of a plurality of data records as representing a  
8     management record, a surgery record, a facility record, an ancillary record and a prescription  
9     drug record;
  - 10          (d)     reading at least one pre-defined relation between at least one of a diagnosis code  
11     and a treatment code and pre-defined medical episodes;
  - 12          (e)     grouping said identified at least one of a plurality of data records to a medical  
13     episode based upon the pre-defined relation; and
  - 14          (f)     resetting a sequential episode counter for the patient.
- 1           2.     The process as claimed in Claim 1 wherein said step of gathering said input data  
2     includes assigning all appropriate said treatment and cost information to one said episode.
- 1           3.     The process as claimed in Claim 1 wherein said step of grouping said claim  
2     records includes classifying the patient records into episode treatment groups.
- 1           4.     The process as claimed in Claim 3 wherein said episode treatment groups include  
2     547 statistically stable and clinically homogeneous groupings with respect to the underlying  
3     cause of said illness and said treatment requirement.
- 1           5.     The process as claimed in Claim 3 wherein an active and open said episode  
2     treatment group includes said episode treatment group number, sequential said episode number,  
3     most recent anchor from date of said treatment and most recent sequential anchor record count.

1           6.       The process as claimed in Claim 3 wherein said episode treatment group includes  
2 a single record for each individual said episode containing said episode treatment group number,  
3 said patient age, said patient sex, said episode number, total said charges, total said payments,  
4 earlier said anchor record, last said anchor record, whether said episode was closed, number of  
5 days between said database start date and earliest said anchor record, whether a number of days  
6 between said database start date and earliest said anchor record exceeds said episode treatment  
7 group's days interval, said patient identification, physician identification, management charges,  
8 said management paid, surgery charges, said surgery paid, said ancillary charges and said  
9 ancillary paid.

1           7.       The process as claimed in Claim 3 wherein said episode treatment groups contain  
2 at least one cluster.

1           8.       The process as claimed in Claim 7 wherein said cluster contains said ancillary  
2 records and said anchor record.

1           9.       The process as claimed in Claim 3 wherein said step of grouping said claim  
2 records includes adjusting for casemix, thereby allowing valid comparisons to be made between  
3 the said treatment patterns of said providers.

1           10.      The process as claimed in Claim 3 wherein said step of grouping said claim  
2 records includes accounting for differences in said patient severity including said patient age,  
3 complicating conditions, comorbidities and major surgeries.

1           11.      The process as claimed in Claim 3 wherein said step of grouping said claim  
2 records includes grouping said claim records into at least one of said management, said surgery,  
3 facility, said ancillary, prescription and other said treatment episodes.

1           12.      The process as claimed in Claim 11 wherein said management records include  
2 said claim records representing said service by said provider engaging in at least one of direct  
3 evaluation, said management and said treatment of said patient.

1           13.     The process as claimed in Claim 11 wherein said ancillary records include said  
2     claim records representing services being incidental to direct said evaluation, said management  
3     and said treatment of said patient.

1           14.     The process as claimed in Claim 1 wherein said step of gathering said input data  
2     includes the step of gathering said input data from in-patient, ambulatory and said ancillary  
3     claims for each said patient.

1           15.     The process as claimed in Claim 1 wherein said step of gathering said input data  
2     includes the step of gathering all relevant information during said treatment episode, regardless  
3     of said treatment duration, including said provider, said CPT code and diagnosis code.

1           16.     The process as claimed in Claim 1 wherein said step of outputting and  
2     discontinuing said processing on invalid said claim records includes comparing ICD-9 and said  
3     CPT codes.

1           17.     The process as claimed in Claim 16 wherein said step of outputting invalid said  
2     claim records includes the step of assigning a different said episode treatment group for an  
3     invalid said ICD-9 code, an invalid said CPT code and an invalid said provider type.

1           18.     The process as claimed in Claim 1 wherein said step of identifying valid said  
2     episode treatment groups for said Group Charge Norms includes comparing current said CPT  
3     codes to prior related said episodes in look-up tables.

1           19.     The process as claimed in Claim 1 wherein said step of flagging valid said claim  
2     records includes flagging said claim records with a short said diagnosis code.

1           20.     The process as claimed in Claim 1 wherein said step of flagging valid said claim  
2     records includes incrementing a said sequential anchor count and a said sequential episode count  
3     for each said episode treatment group assignment.



1           21.     The process as claimed in Claim 1 wherein said step of creating a recurrent said  
2 episode treatment group and resetting said episode window when said episode treatment group  
3 matches a prior said episode treatment group includes resetting said window for an additional  
4 period of time until said patient being asymptomatic for a pre-determined time period.

1           22.     The process as claimed in Claim 1 wherein said step of creating a recurrent said  
2 episode treatment group and resetting said episode window when said episode treatment group  
3 matches a prior said episode treatment group includes selecting the most recent said claim record  
4 if more than one matched said claim record exists.

1           23.     The process as claimed in Claim 1 wherein said step of shifting said patient's said  
2 episode includes changes in said condition including at least one of comorbidity, complication  
3 and defining surgery.

1           24.     The process as claimed in Claim 1 wherein said step of shifting said patient's said  
2 episode includes shifting said episode treatment group originally assigned by a first said  
3 diagnosis on said claim record based on at least one of a second, third and fourth said diagnosis.

1           25.     The process as claimed in Claim 1 wherein said step of identifying all valid said  
2 episode treatment groups for said Group Charge Norm codes includes comparing current said  
3 Group Charge Norm codes to prior related said episodes by analyzing said Group Charge Norms  
4 by said episode treatment group and National Drug Code by said Group Charge Norm said look-  
5 up tables.

1           26.     The process as claimed in Claim 1 wherein said step of identifying said providers  
2 treating similar said episodes includes identifying each said treatment episode by Primary Care  
3 Physician.

1           27.     The process as claimed in Claim 1 wherein said step of comparing said financial  
2     and said clinical performance includes analyzing said components of said provider's said  
3     treatment plan by uncovering said casemix-adjusted differences in direct said patient said  
4     management, the use of said surgery and the prescribing of said ancillary services.

1           28.     The process as claimed in Claim 1 wherein said step of comparing said financial  
2     and said clinical performance includes identifying excessive utilization and said cost areas and  
3     developing continuous quality improvement protocols based on at least one of internally and  
4     externally derived benchmarks.

1           29.     The process as claimed in Claim 1 wherein said step of comparing said financial  
2     and said clinical performance includes adjusting for location and using geographically derived  
3     normative charge information for comparing said cost performance of said providers and entire  
4     said networks.

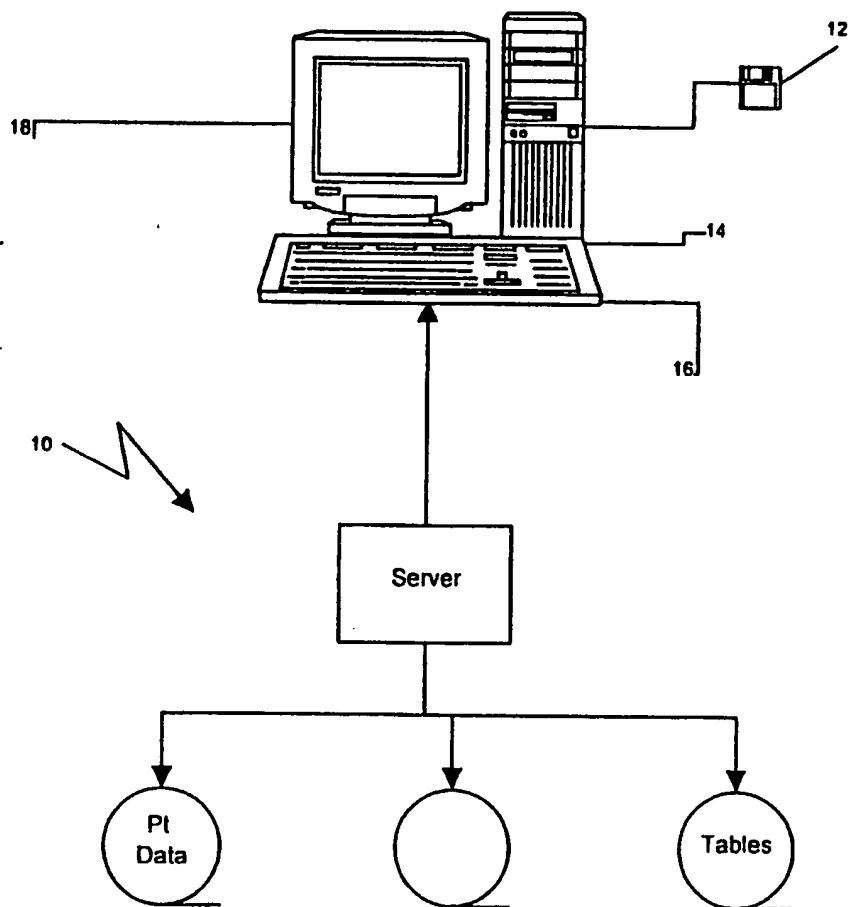
1           30.     The process as claimed in Claim 1 wherein said step of comparing said financial  
2     and said clinical performance includes measuring both prevalence and incidence rates among a  
3     given population by quantifying health care demand in one population and comparing it to  
4     external said utilization norms.

1           31.     The process as claimed in Claim 1 wherein said step of comparing said financial  
2     and said clinical performance includes identifying said providers practicing outside established  
3     said utilization and said cost norms.

1           32.     A digital identifier for identifying a cluster of correlated medical services  
2     rendered to a single medical patient by a medical provider, characterized by a plurality of bits  
3     embedded in a patient's data record encoding a cluster value identifying a cluster to which the  
4     patient's data record is correlated.

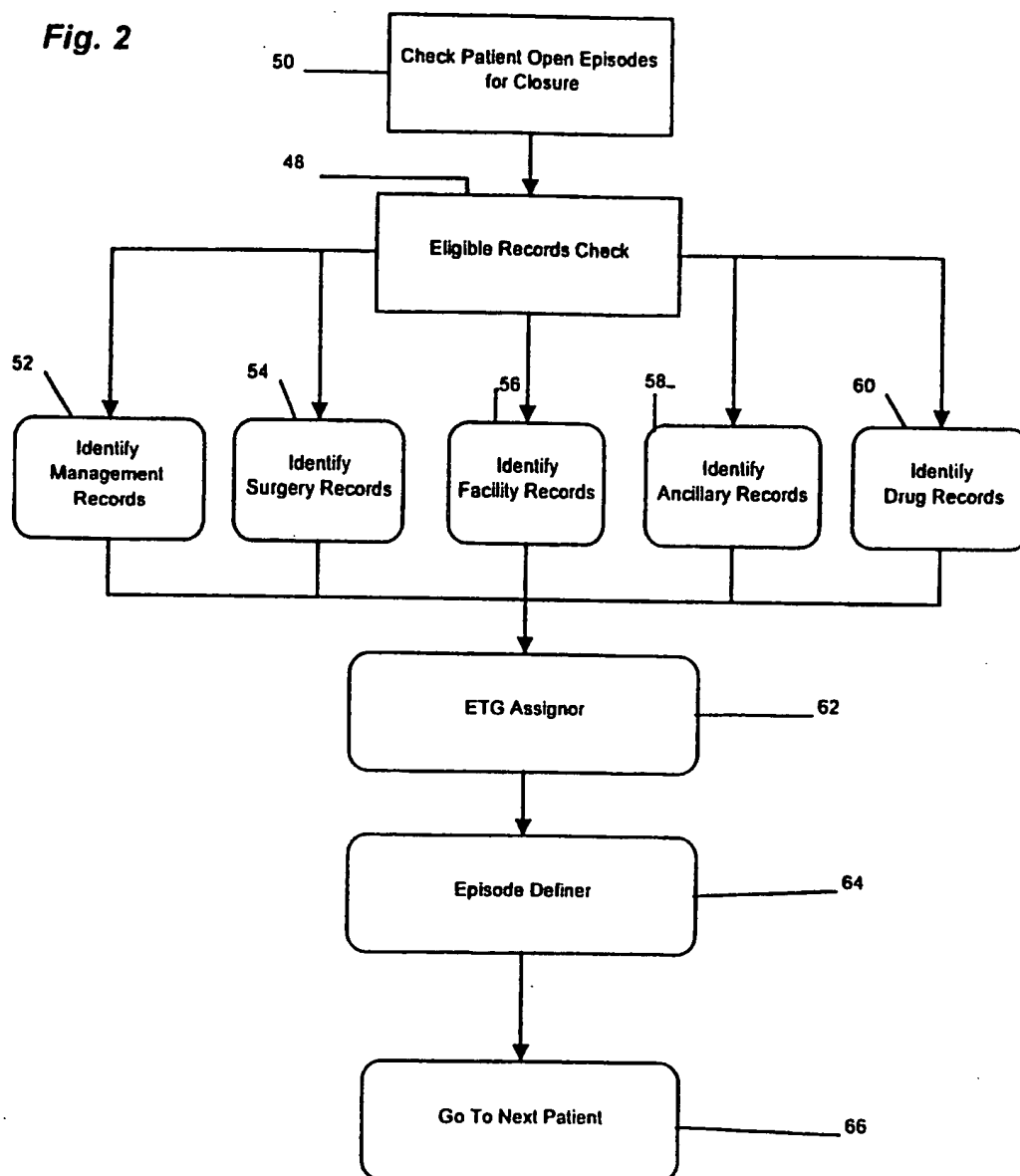
1           33.     An episode treatment group characterized by one or more digital identifiers  
2     according to Claim 32.

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**Fig. 1**

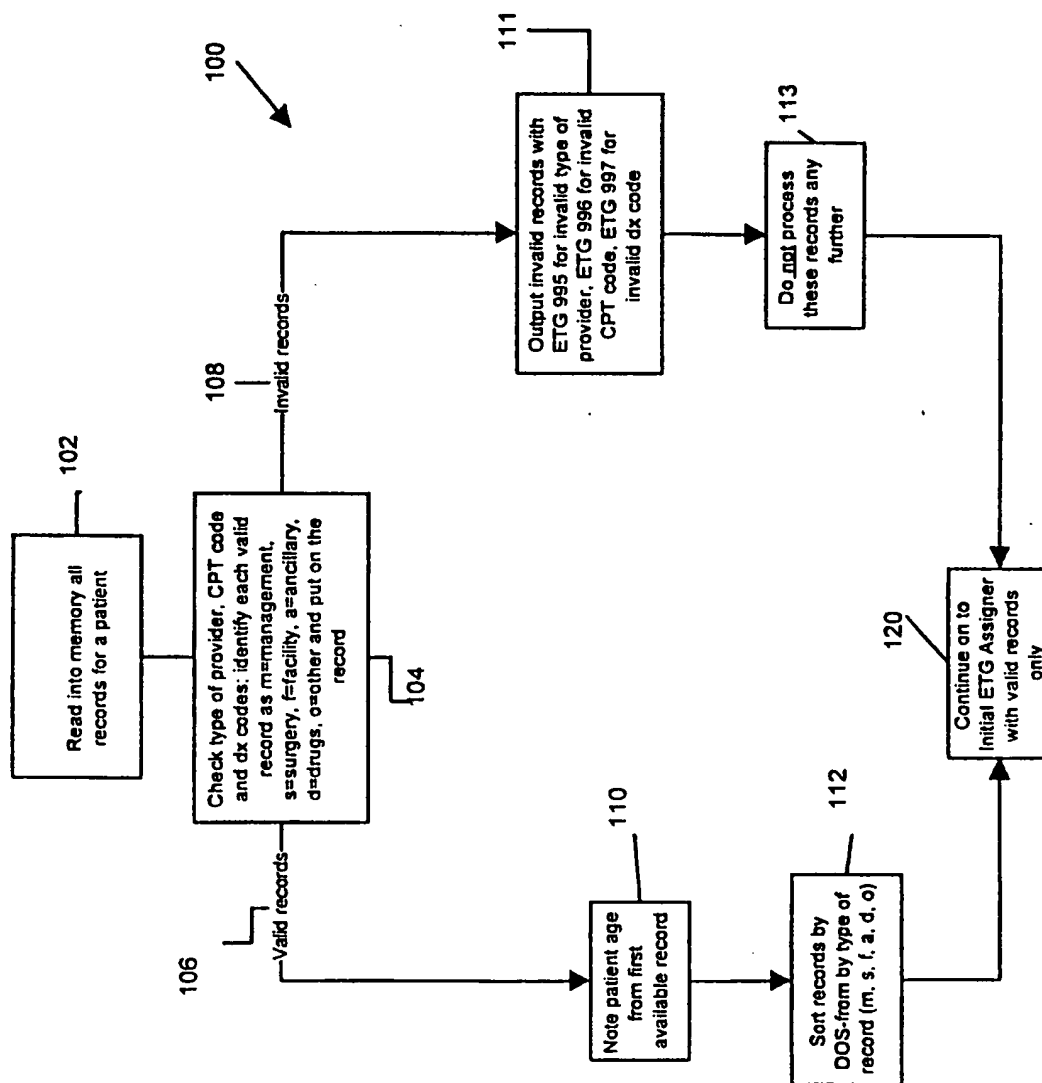
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Fig. 2

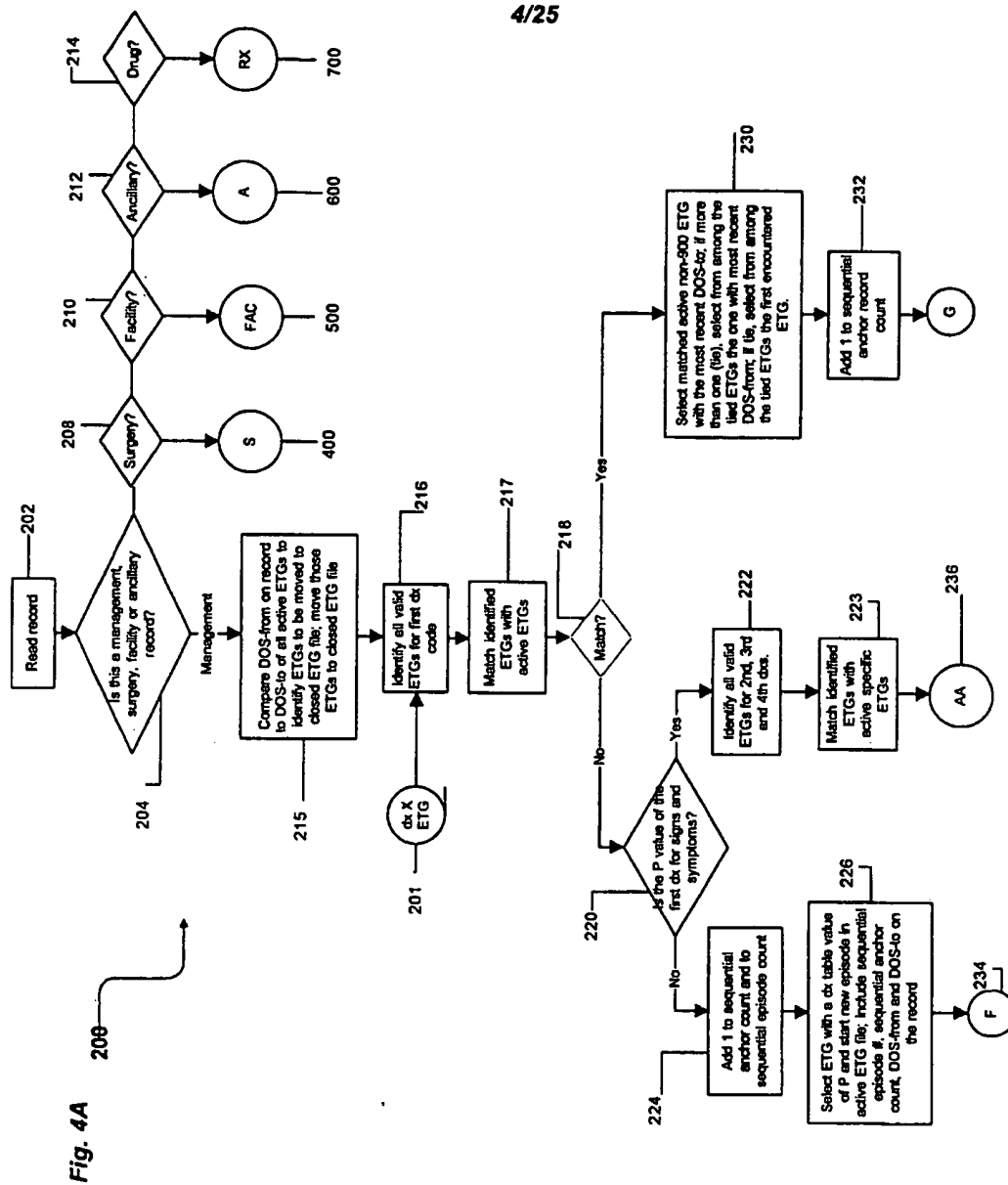


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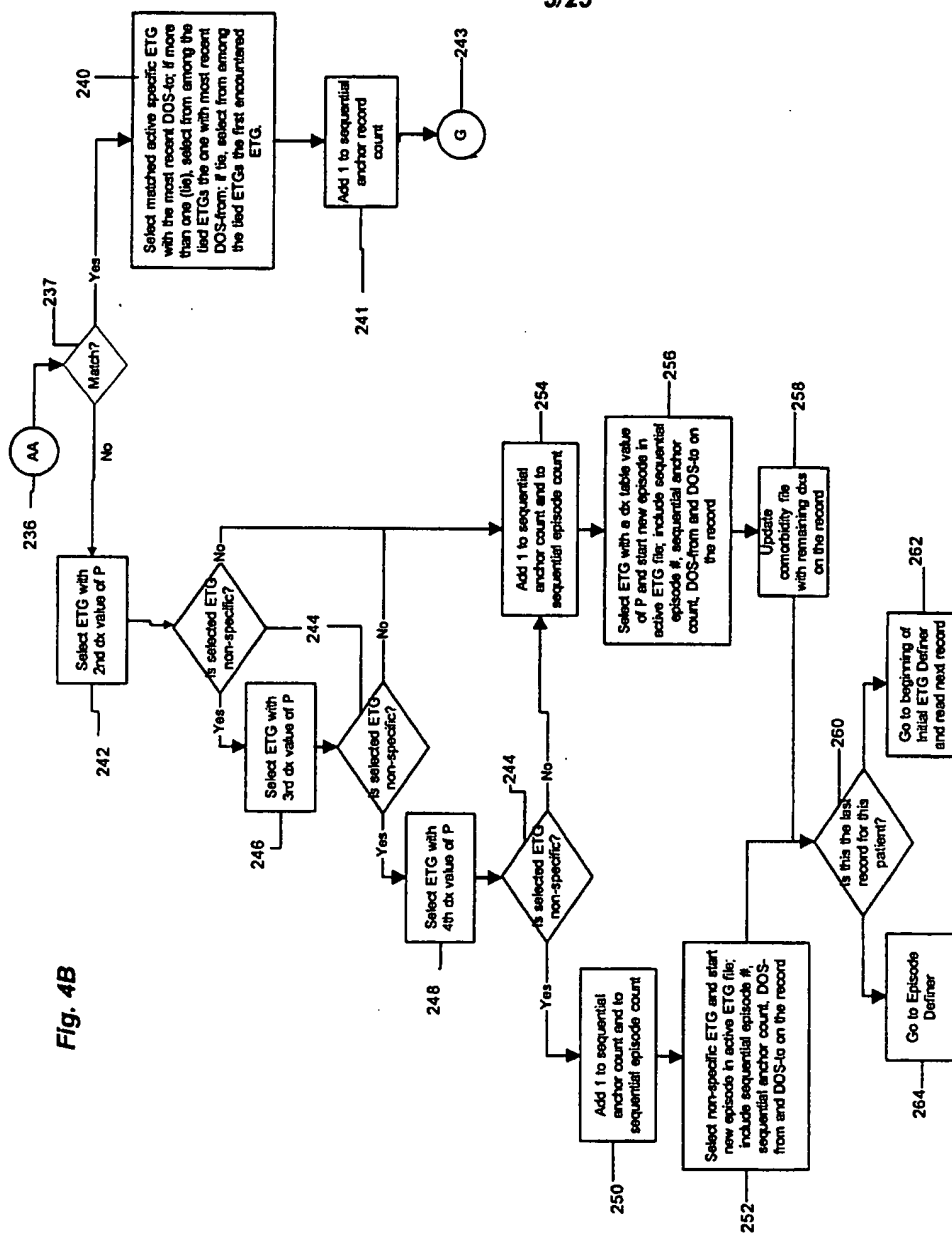
Fig. 3



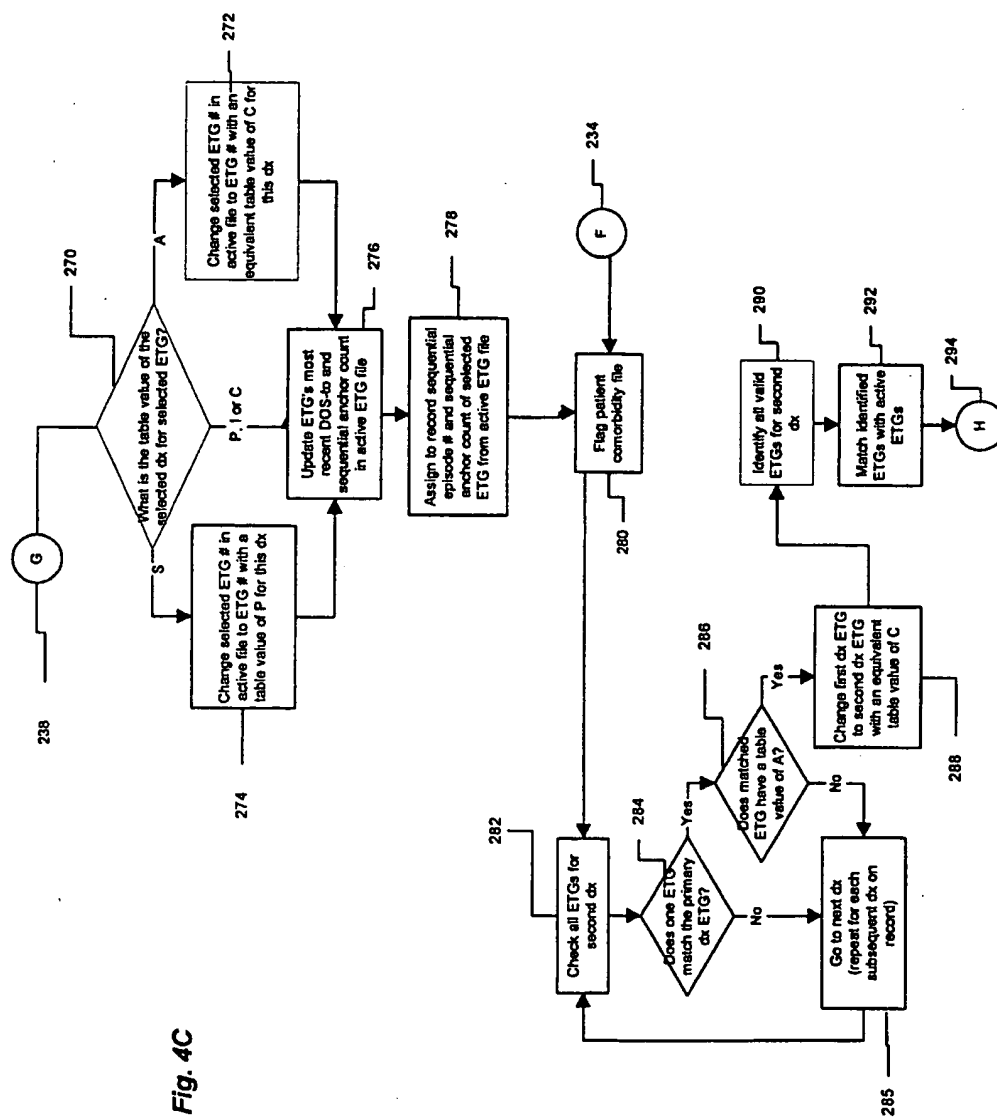
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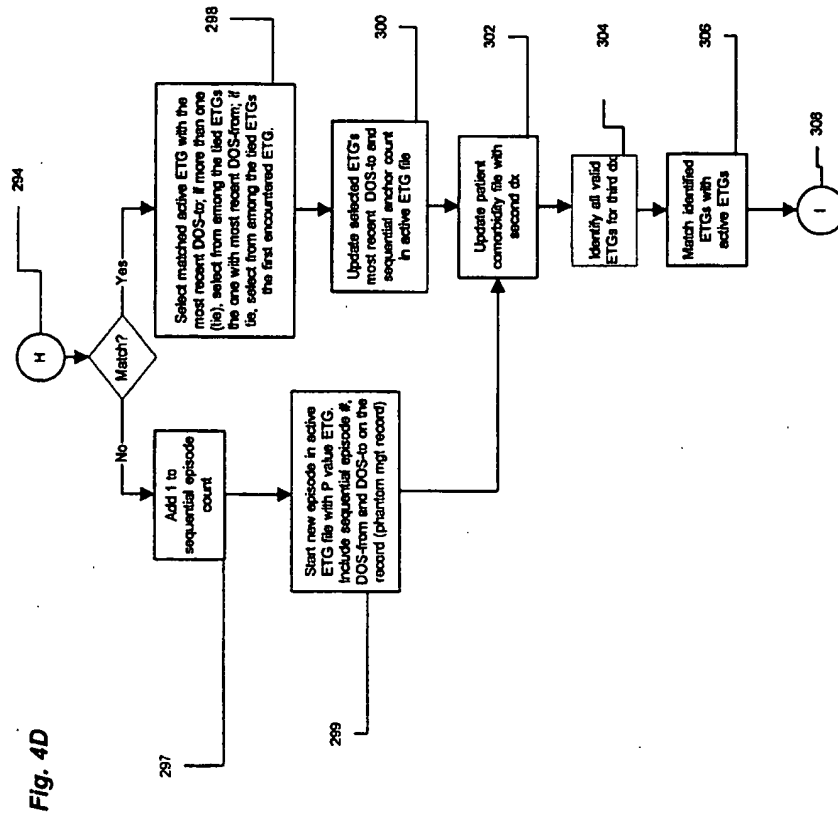


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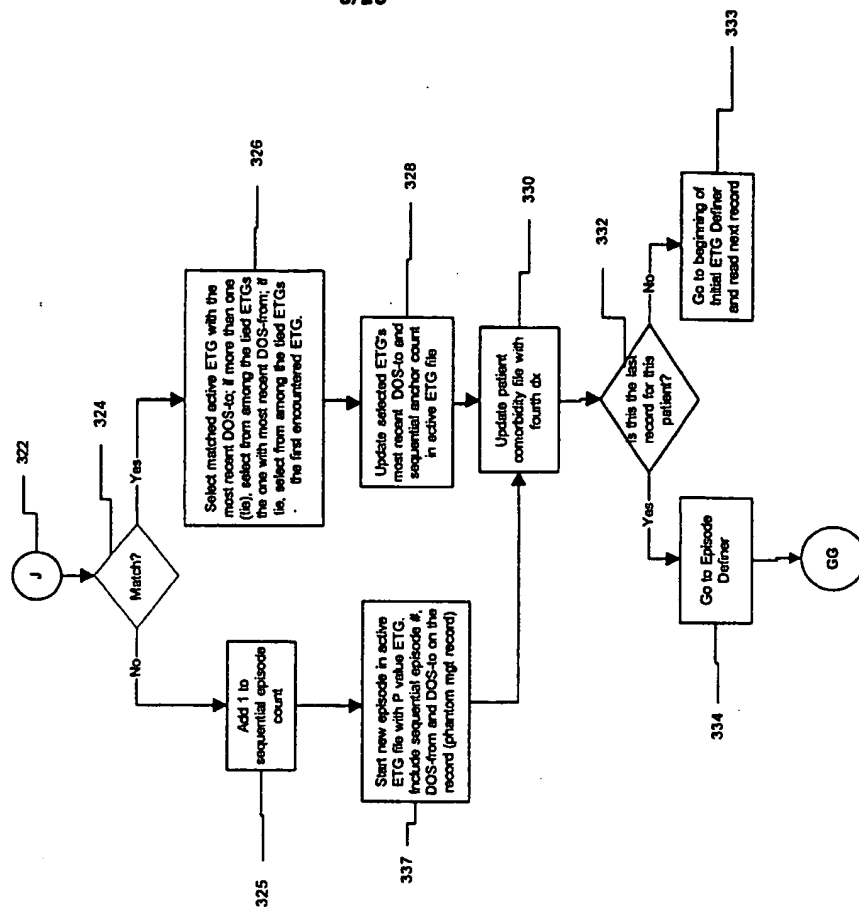
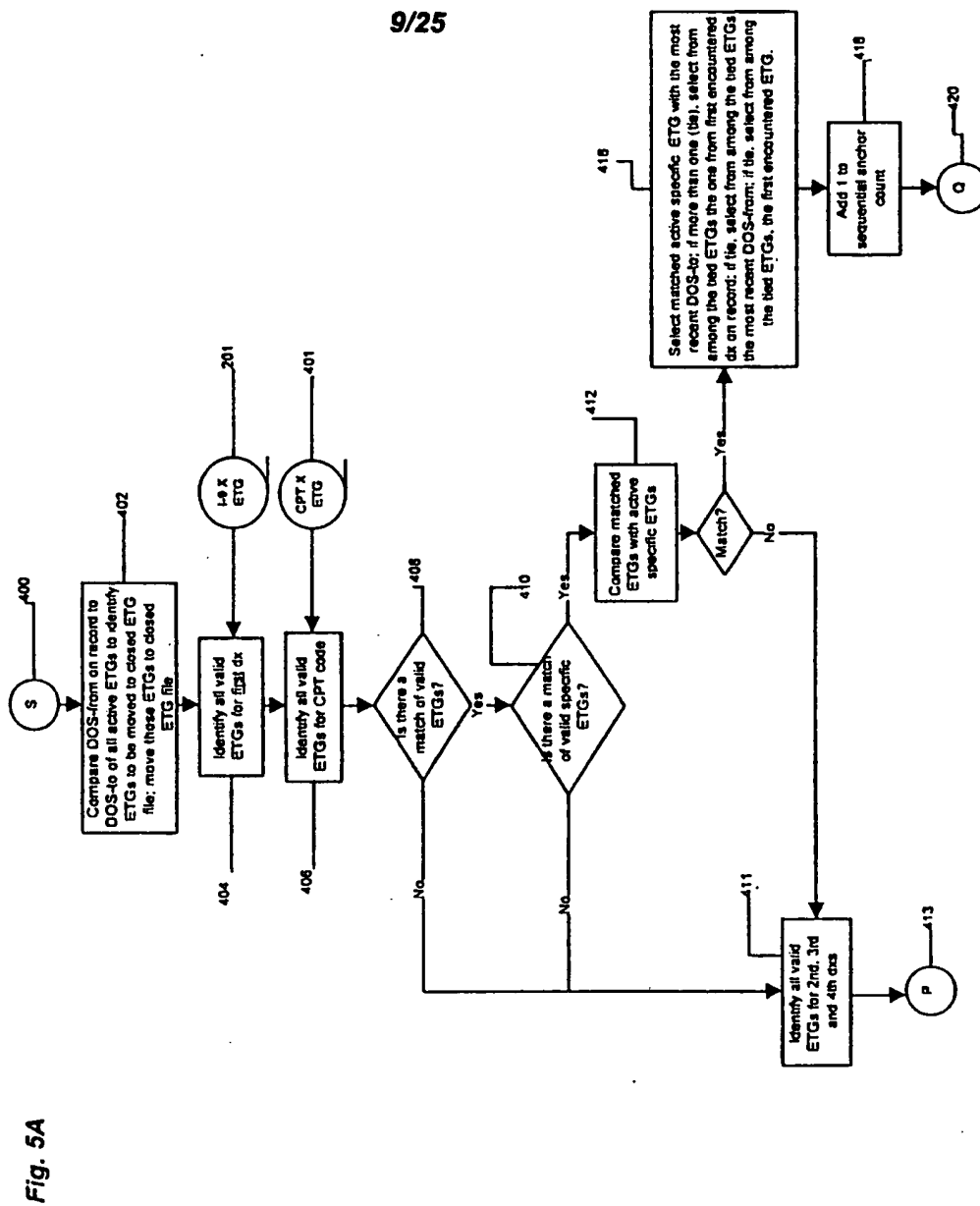


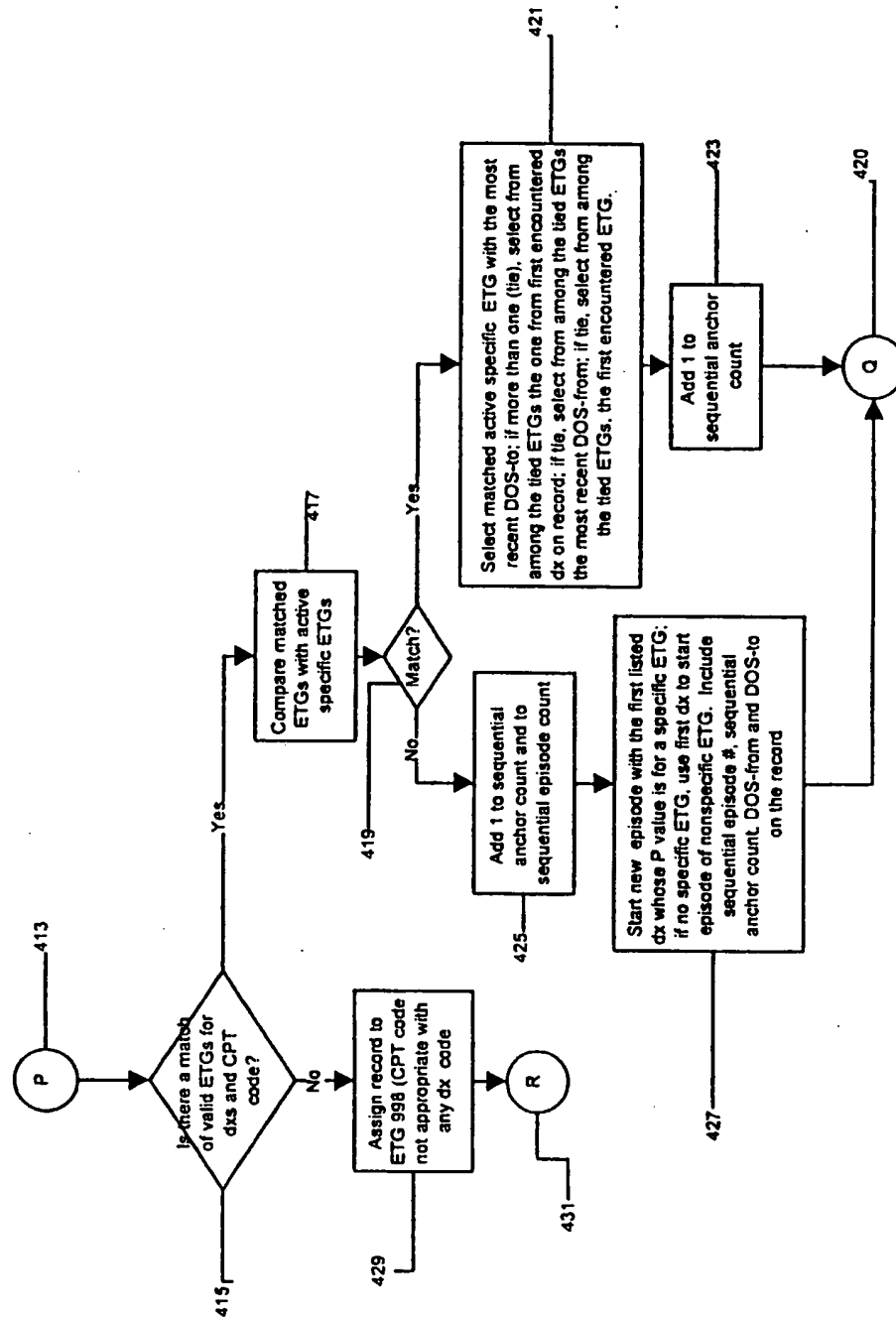
Fig. 4E

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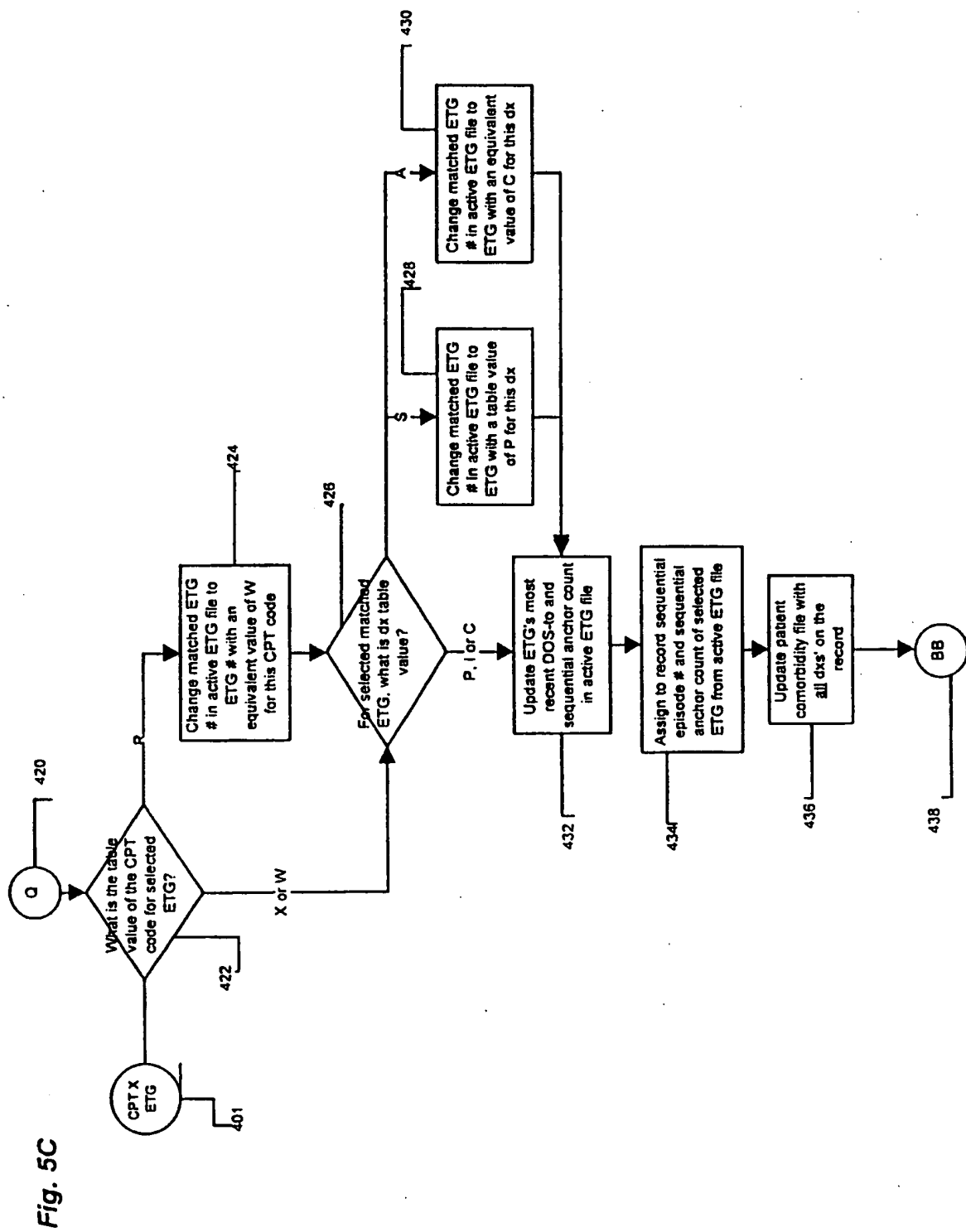


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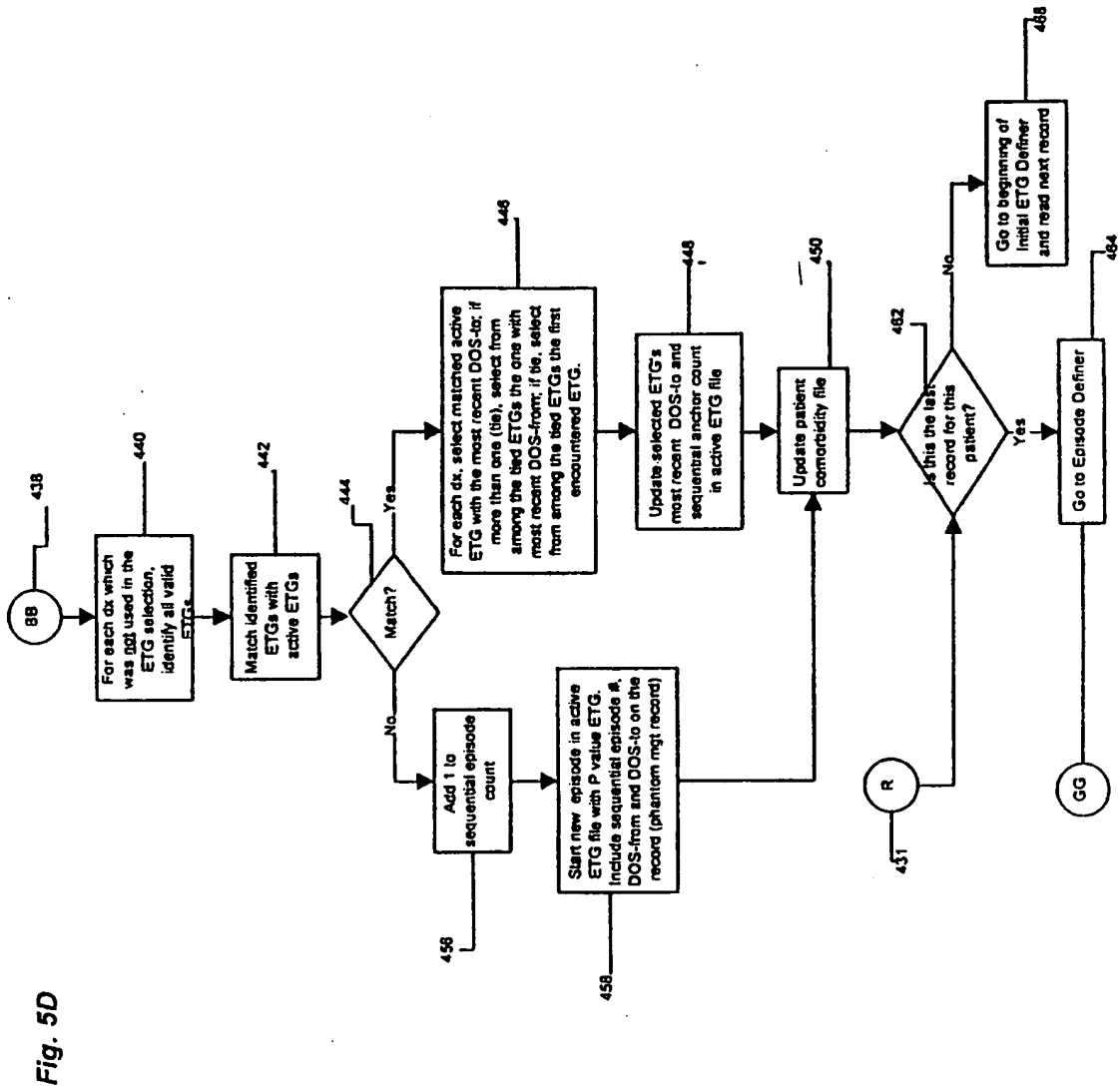
Fig. 5B



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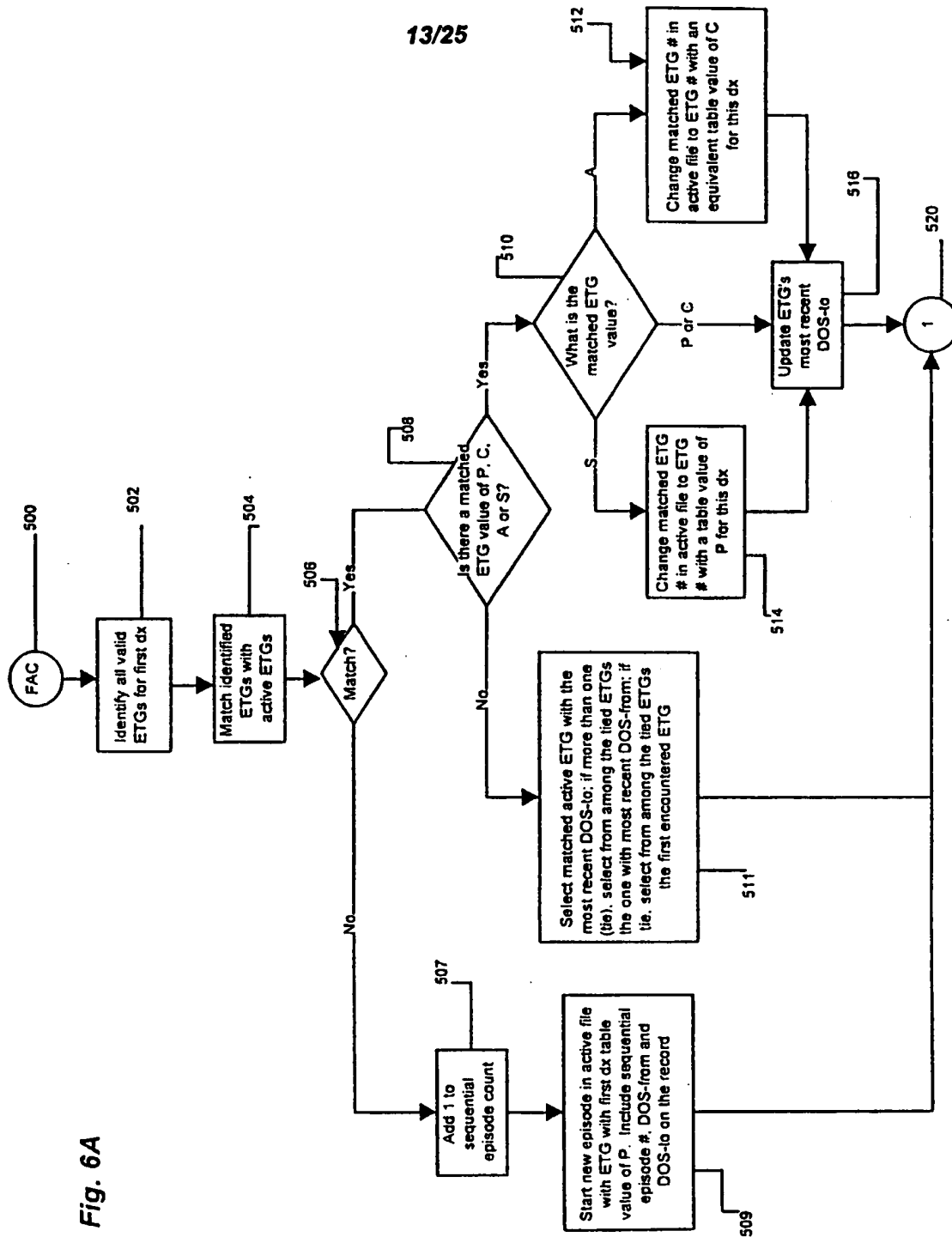
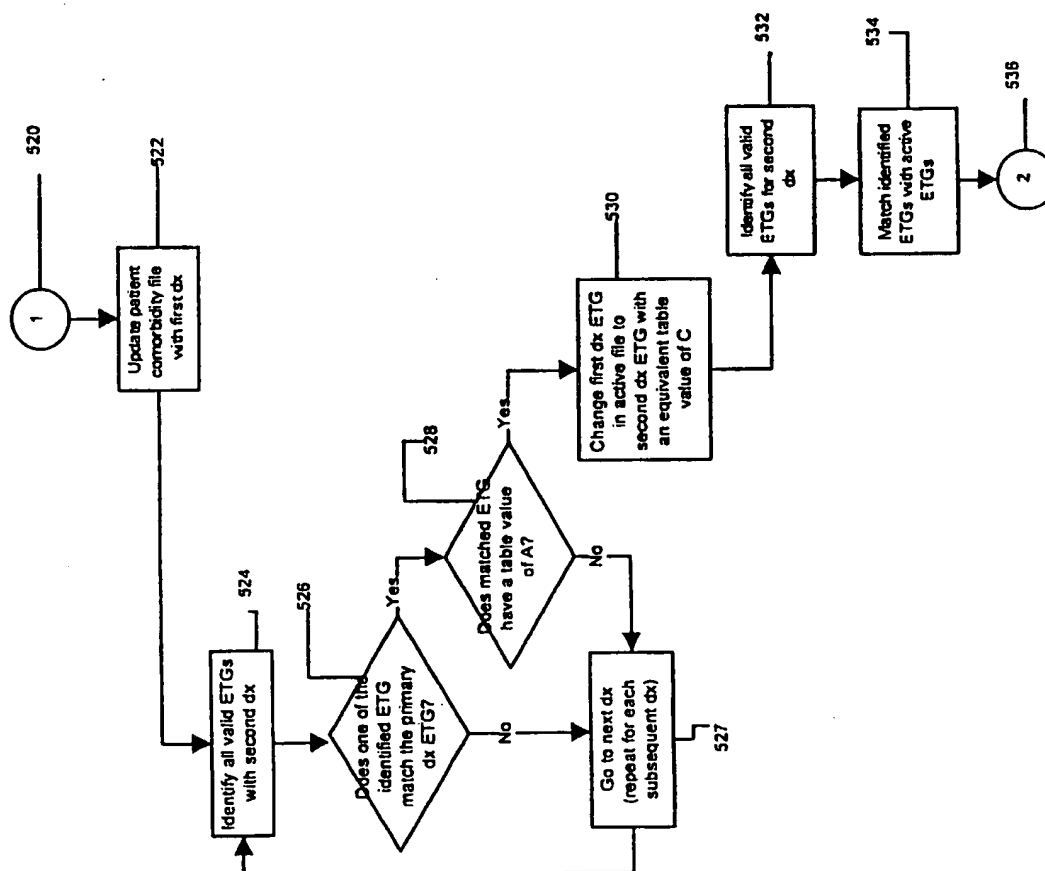


Fig. 6A

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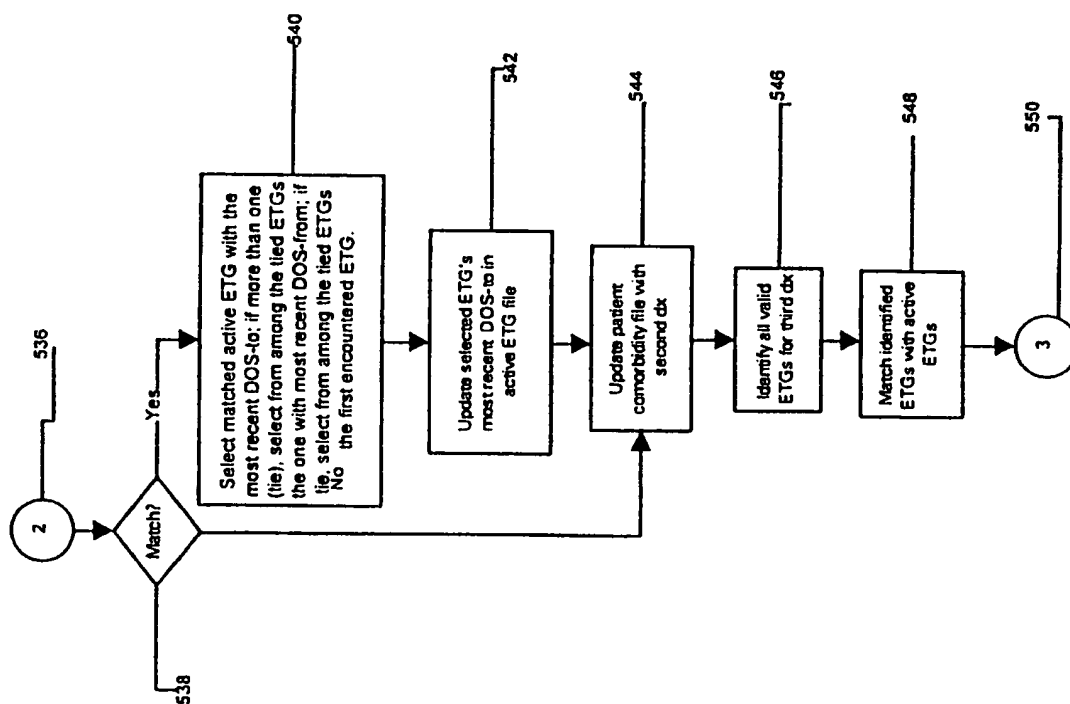
Fig. 6B





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Fig. 6C



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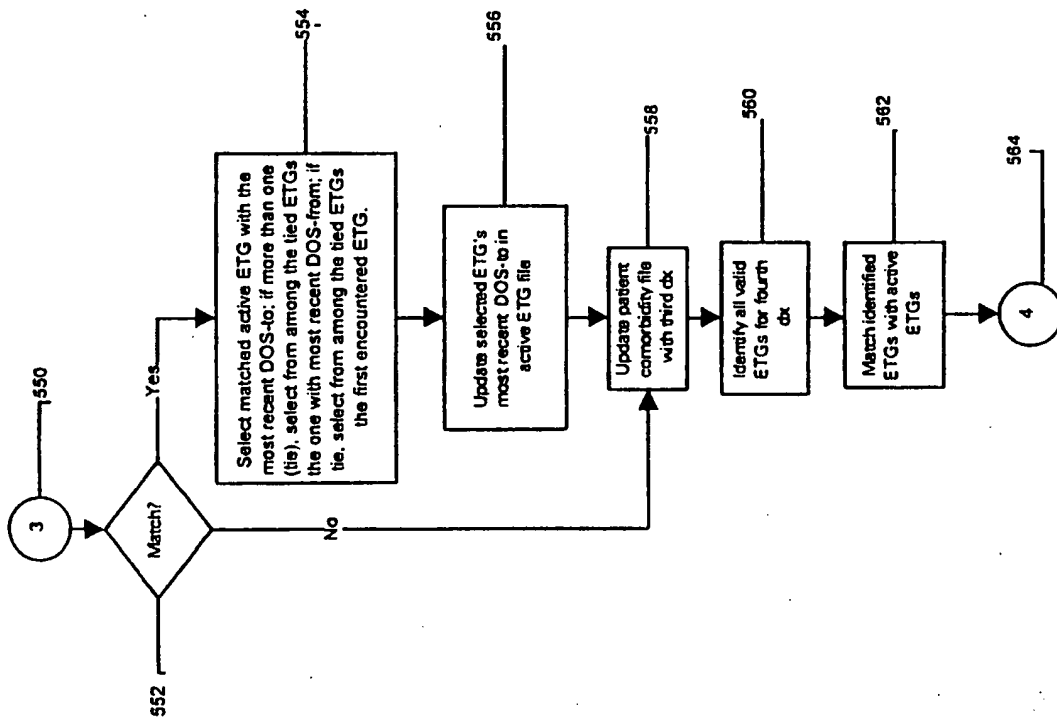


Fig. 6D

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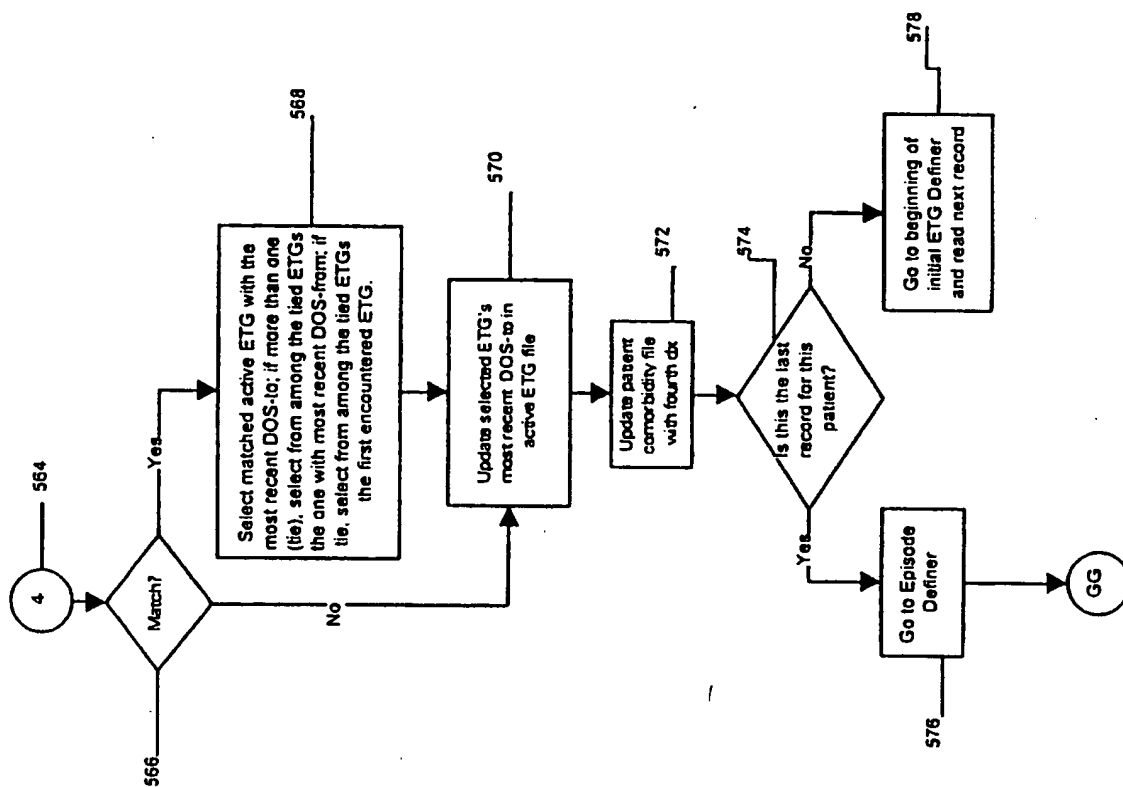


Fig. 6E

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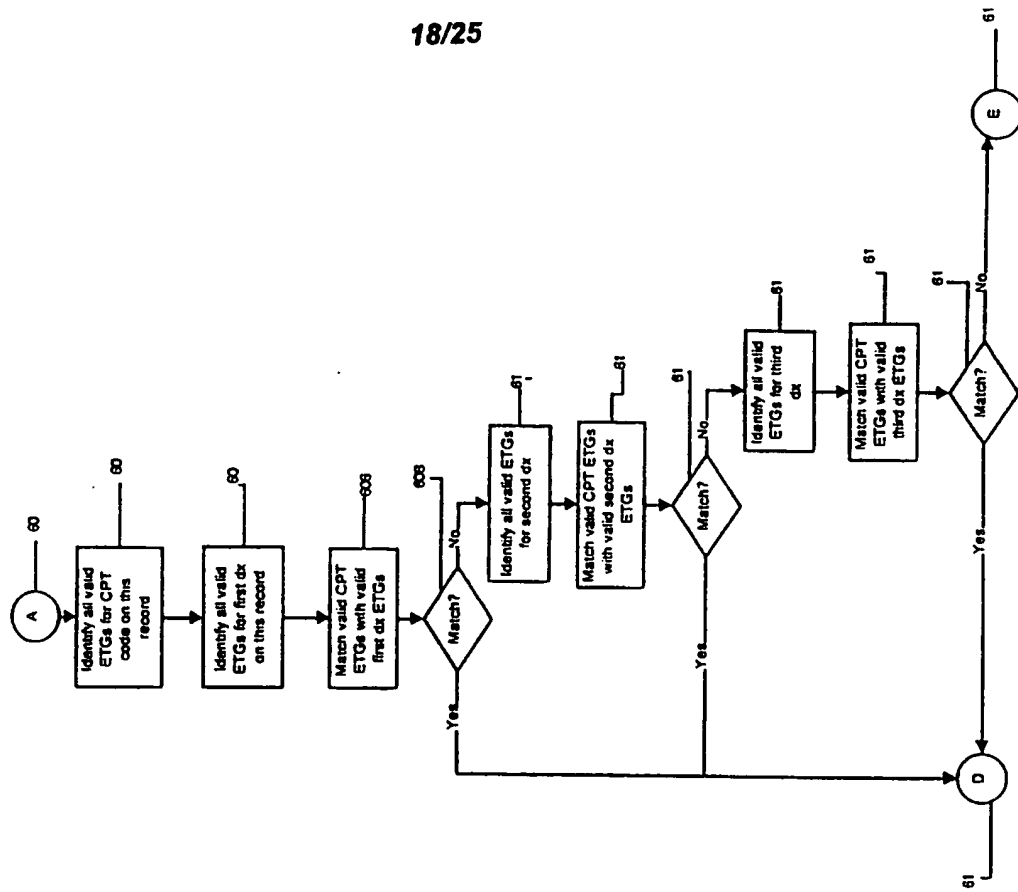


Fig. 7A

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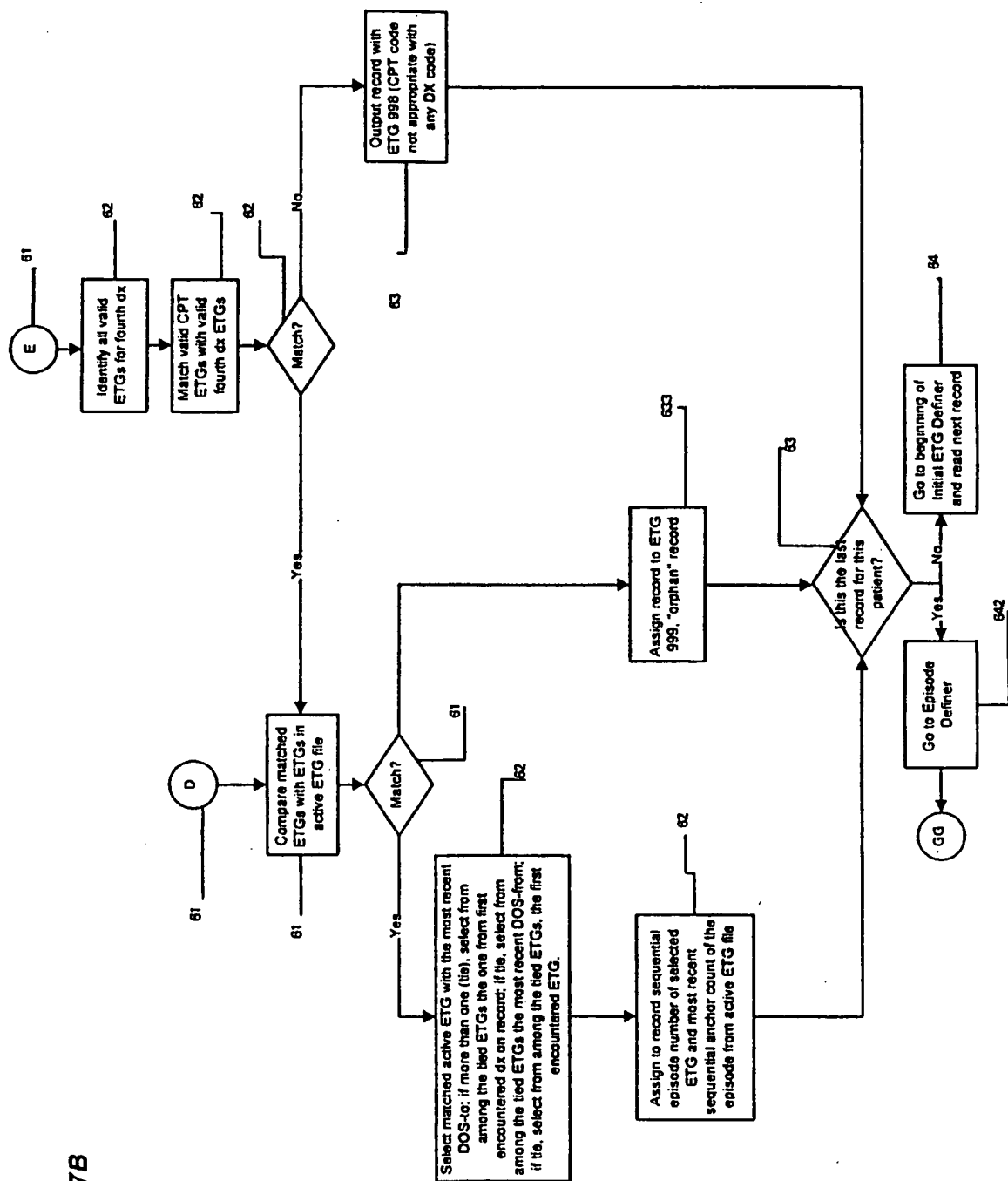


Fig. 7B

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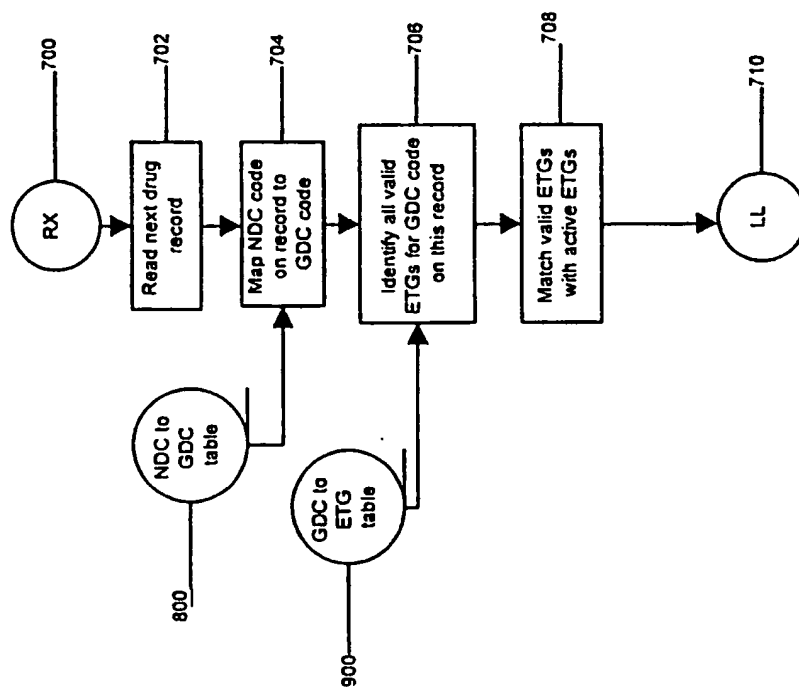
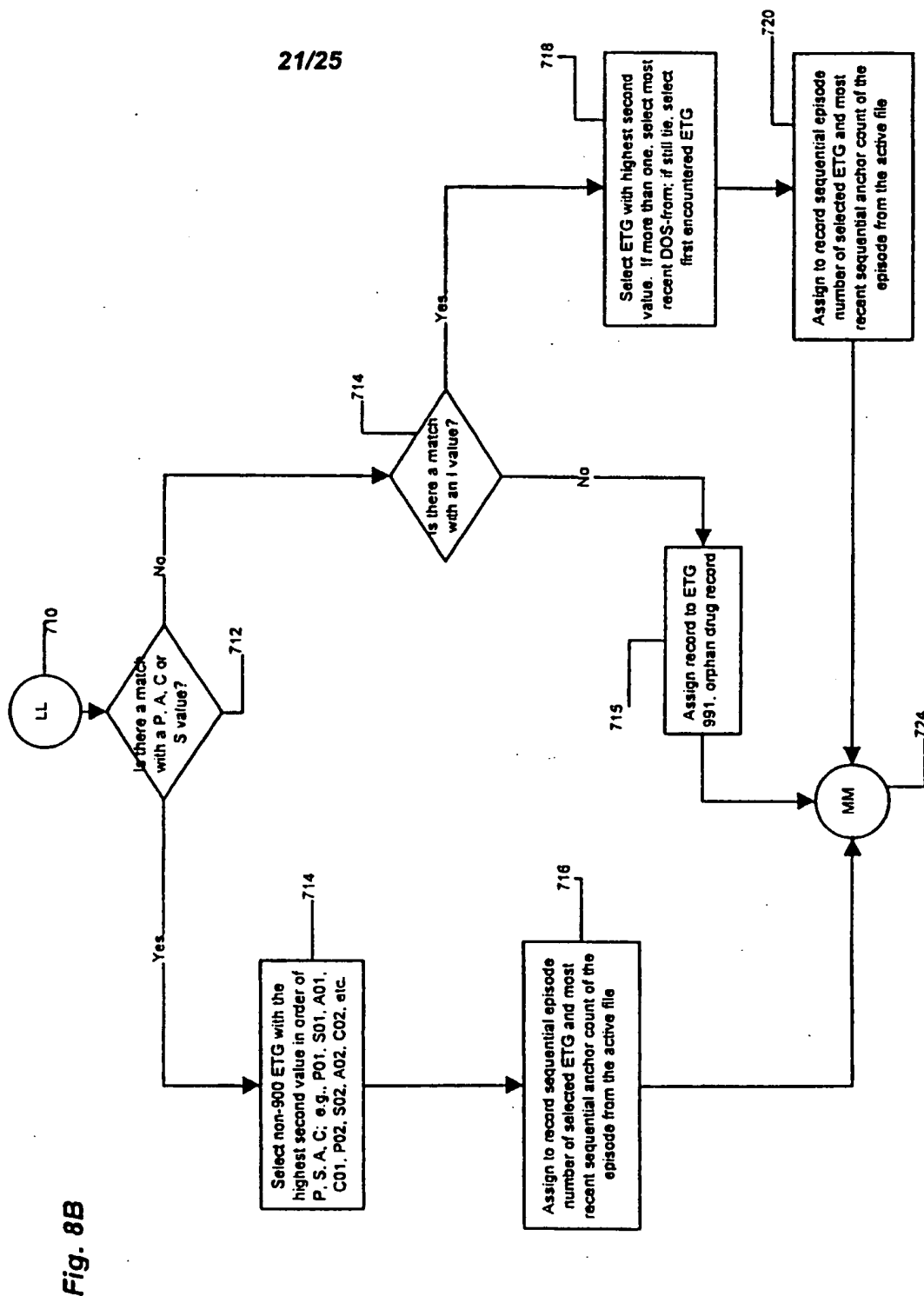


Fig. 8A

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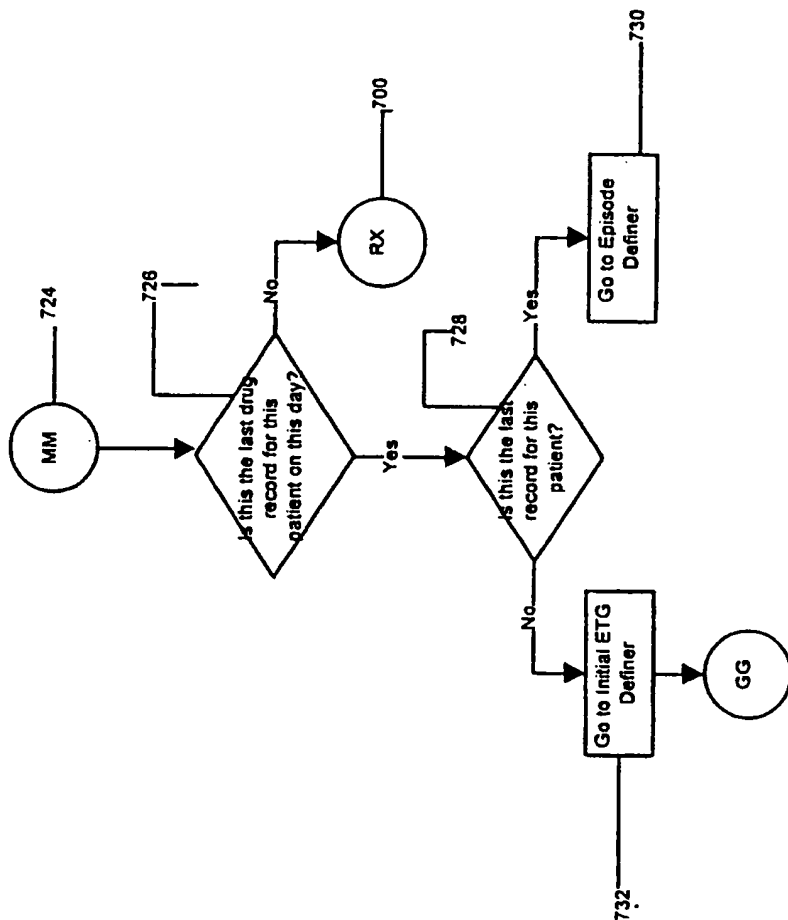
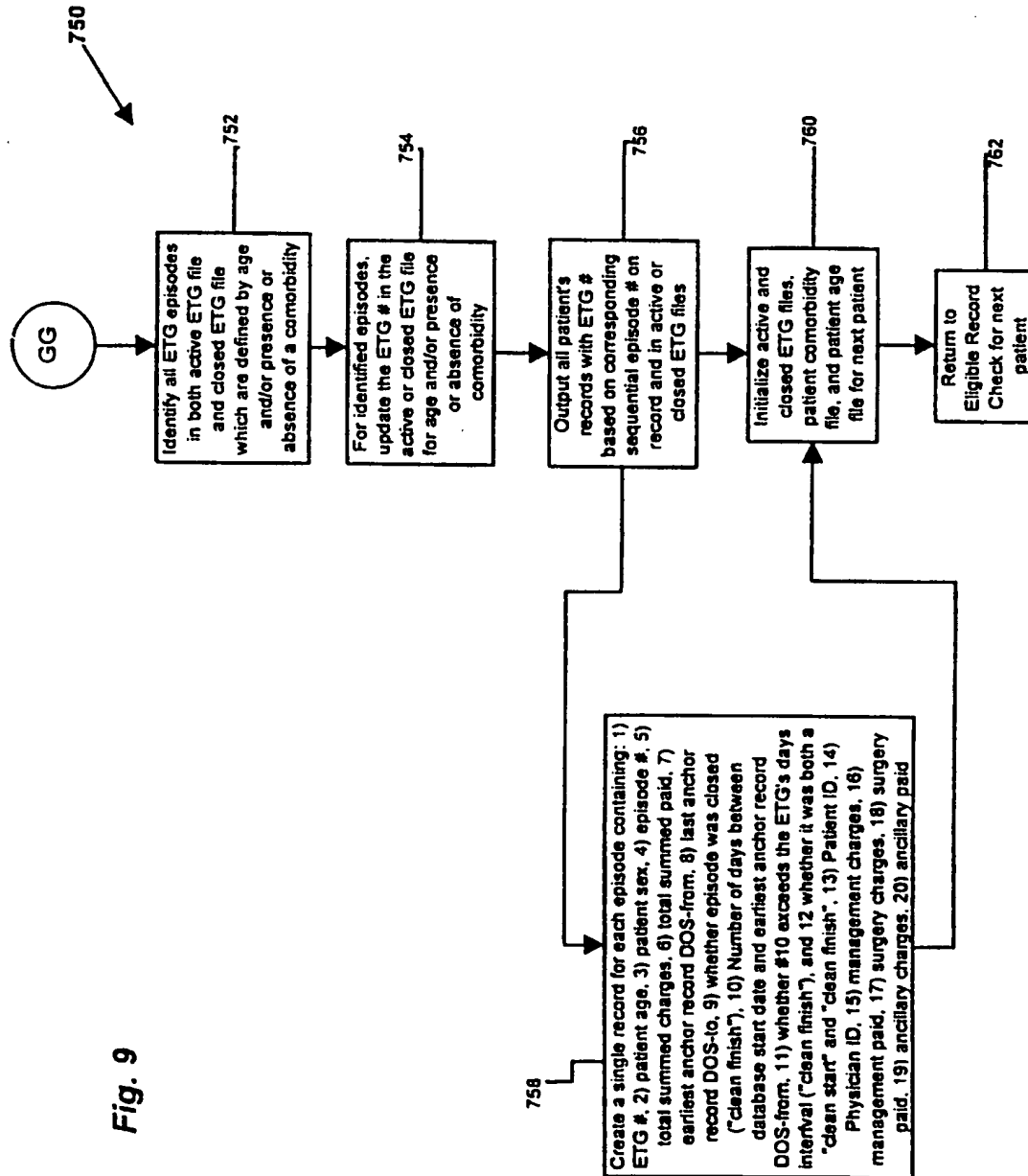


Fig. 8C



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Episode Treatment Group = Clustered Management/Ancillary Records

**Management Records**

84 —●— Office Visit

85 —X— Hospital/ER

86 —△— Surgery and Follow-Up

**Ancillary Records**

87 —■— Lab Test

88 —▽— X-Ray and Lab

89 —⊗— X-Ray

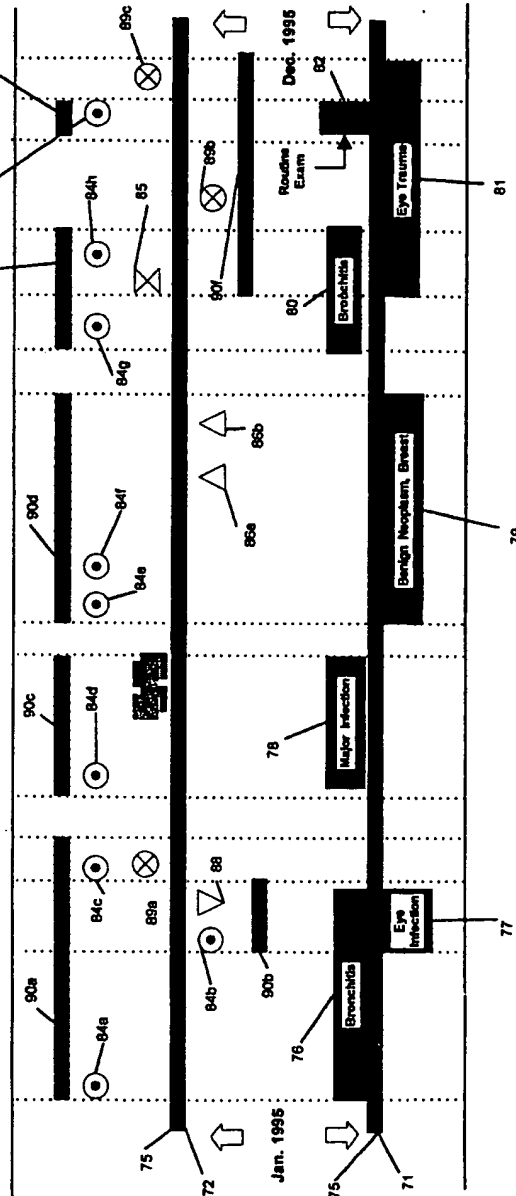


Fig. 10

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ETG	.....	265	266	.....	400	401	402	404	.....
Dx Code									
162					C1	P	A1	S	
2122					I	I	I	P	
...									
...									
...									
...									
...									
414.8		P	S						
415		I	P						

Fig. 11

	....	ETG	ETG	ETG	ETG	....
Surgery Code	...	400	401	402	404	....
31766		W2	R2	W1	R1	

Fig. 12

NDC	GDC
...	
...	
00002510501	40973
00002510501	40973
61392028990	35472
00002505818	39713
00002505818	39713
61392028990	35472
61392028990	35472
0000203529	16192
0000203529	16192
61392028990	35472

Fig. 13

GDC	ETG	RANK
40973	450	P1
39713	329	I1
39713	328	P1
39713	373	P7
39713	390	A7
39713	374	S7
16192	900	P1
40973	450	P2
35472	46	P6
35472	648	S7

Fig. 14

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US96/10787

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(6) :G06F 15/00

US CL :364/401M

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 364/401M, 406

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

MAYA

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 4,667,292 (Mohlenbrock et al.) 19 May 1987, cols. 1-13.	1-4, 7-15, 32-33
Y	US, A, 5,018,067 (Mohlenbrock et al.) 1991, cols. 5-17.	1-4, 7-15, 32-33
Y	US, A, 5,253,164 (Holloway et al.) 12 October 1993, entire document.	1-4, 7-15
Y	US, A, 5,557,514 (Seare et al.) 17 September 1994, entire document, especially col. 4 line 28 to col. 7, line 43; col. 12 line 49 to col. 13, line 60.	1-4, 7-15, 32-33
Y	US, A, 5,536,425 (Torma et al.) 15 November 1994, col. 2, line 61 to col. 3, line 15.	9-10

☒ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

* Special categories of cited documents:	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"E" earlier document published on or after the international filing date	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&"	document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means		
"P" document published prior to the international filing date but later than the priority date claimed		

Date of the actual completion of the international search 28 OCTOBER 1996	Date of mailing of the international search report 07 NOV 1996
Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer GAIL O. HAYES BRIAN A. HARDEN PARALEGAL SPECIALIST GROUP 2400 Telephone No. (703) 305-9711

## INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US96/10787

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US, A, 5,325,293 (Dorne) 28 June 1994, col 3, lines 18-50.	1-4, 7-15